REGIONAL ASSOCIATION OF OIL AND NATURAL GAS COMPANIES IN LATIN AMERICA AND THE CARIBBEAN

ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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GUIDELINES FOR AN

ENVIRONMENTAL IMPACT ASSESSMENT

(EIA) PROCESS

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1.0 PREAMBLE

Environmental Impact Assessment is now widely recognized in many parts of the world as an important tool for integrating environmental considerations into the planning process for all forms of industry and government development projects. Over the past two decades, the environmental review process has become increasingly sophisticated, and the scope has expanded to reflect a growing environmental awareness on behalf of the general public. Social, economic and community concerns, as well as policy and management decisions, have been added to broaden the definition of environment beyond its original biophysical dimensions.

Prior to the 1960's, environmental factors seldom entered into the economic equation, and it was often assumed that the benefits of economic development would more than compensate for any deterioration in environmental quality associated with these developments. Environmental factors were often ignored in the decision-making process, with the result that numerous environmental problems or crises began to be recognized. Remedial measures were identified as being necessary but very expensive to implement.

Most economic development activities are now subject to some form of public scrutiny as well as regulatory approval at either the local or national level. An international dimension has been introduced where public awareness has expanded to include environmental issues on a global scale e.g. ozone depletion and the greenhouse effect. Recognition of this increased public awareness of environmental concerns in a global context now transcends national boundaries, to the point where the need to include consideration of these concerns is often linked to foreign aid and financial assistance programs.

The growing importance of environmental factors in the decision-making process is also reflected in more enlightened corporate attitudes. The Environmental Impact Assessment process covers not only new projects but includes expansion programs for existing facilities, as well as logistics and all associated infrastructure requirements. Recognition of the tangible benefits of environmental impact assessments at the corporate level, particularly the positive effects on company credibility and public image, have helped the EIA process to mature over the years.

The following guidelines have been designed to assist the ARPEL member companies in providing a uniform set of procedures for the timely review of the environmental aspects of all phases of hydrocarbon exploration, production and transportation.

The guidelines serve as an umbrella or focus for, and extension of, the other environmental operating guidelines being developed as part of the overall ARPEL/CIDA project. Application of the environmentally sound procedures contained in the operating guidelines is an important component of the environmental impact assessment process.

More important, these guidelines attempt to provide a consistent framework and set of procedures in support of the position already established in the "Code of Environmental Conduct" and "Code of Environmental Practice" to which the member companies of ARPEL are committed.

The guidelines presented in this document draw extensively from the Canadian experience in environmental assessment over the past two decades. While the guidelines have been derived from the Canadian environmental regulatory experience, it is not intended to imply that either the legislative process or the regulatory standards are necessarily appropriate to ARPEL.

Rather the emphasis is on the generic principles and procedures that have emerged as part of the Canadian learning experience; principles and procedures that can be applied at a range of levels to meet the needs of the various ARPEL member companies.
Much of the supporting documentation for these guidelines can be found in the publications issued by the Federal Environmental Assessment Review Office (FEARO). Of particular relevance are the research reports prepared for the Canadian Environmental Assessment Research Council (CEARC).

2.0 PURPOSE

The purpose of these guidelines is to present a set of recommended procedures for the integration of environmental and social considerations into the overall planning process for hydrocarbon exploration and development projects.

The guidelines are necessarily of a generic nature. The environmental impact assessment process is presented as a planning tool with the emphasis on a role of self-assessment in the application of its guiding principles. The process is intended to be capable of being self administered and independent of any legal requirement for environmental impact assessment that may exist in the national legislation of individual ARPEL member countries. Where appropriate, however, the process should be readily adaptable to accommodate any regulatory requirements that do exist in existing legislation(s).

This document provides a rationale for the need to undertake environmental impact assessments, and the benefits that can accrue to companies as a consequence of their implementation.

The need for a corporate organizational structure to introduce environmental and social factors into the planning process at all management and operational levels is addressed, as well as the timing of their introduction.

The ultimate objective of any environmental impact assessment process is to identify any potential adverse effects before they occur. Once identified, suitable mitigative measures can be developed that can be applied to eliminate or reduce any undesirable or harmful effects.

The guidelines contain a phased approach with scoping and screening procedures that can be applied to ensure that the level of detail contained in the assessment is related to the perceived magnitude of the environmental effects associated with various types of projects. For example, small routine operations in less-sensitive environments can often be screened out at an early stage in the assessment process. On the other hand, larger projects with a significant potential for the generation of unwanted environmental effects,

or projects of any size in ecologically sensitive areas, will normally require full application of the assessment process. Suggested threshold criteria are presented for adoption in the screening process.

It is important to note that the perception of environmental impacts associated with projects is often as much a concern of the general public as it is of petroleum company personnel.

An extensive opportunity for public consultation is one of the most important factors contributing to a successful environmental review process. For this reason, it is recommended that minimum standards for public consultation be developed to make sure that an appropriate level of public input is achieved.

The ability to identify correctly the precise nature of the environmental and social impacts associated with petroleum development projects is an art as much as it is a science. All too frequently, the available data base for the pre-project environment is too limited to allow precise scientific identification of all the project-related effects. Even where specific studies have been carried out to determine the baseline conditions and contribute to project design standards, it is very difficult to eliminate effects related to natural fluctuations or those introduced by other forms of development in the same area. It is important therefore to allow as much lead time as possible in carrying out baseline studies. Any such study needs should be identified early in the conceptual planning stages for projects to allow the results to be used in the project design and development of any mitigative measures.

Although it may not always be possible to identify all the environmental and social effects associated with projects with scientific precision, this should not be used as an argument against the implementation of an environmental impact assessment process. Some effects may be subtle and go undetected for long periods of time. Mistakes will be made in identifying impacts and their magnitudes but the consequences will be much less severe than for projects that are allowed to proceed without due concern for environmental factors in the planning process.

The lack of infallibility in the assessment process is one of the primary reasons for the inclusion of feedback mechanisms into the procedures. It is important to apply hindsight to projects to try and determine the accuracy of the predictive capability in identifying impacts and the effectiveness of any mitigative measures that were introduced. Only in this way can the assessment process mature and be more effective in reviews of future projects. The environmental monitoring and environmental audit programs are used to provide this feedback mechanism.

Finally, one of the most important purposes of these guideline is to try and establish a common set of procedures that are mutually acceptable to each of the member companies of ARPEL. The adoption of common procedures will greatly facilitate the pooling of information and experience in a more accurate identification of the specific impacts associated with various hydrocarbon exploration and development activities. This free exchange of experience, based on similar methods, will be of value in streamlining and updating the screening process. It will also aid in the development of possible collaborative programs under the auspices of ARPEL to sponsor research into environmental and social issues that are of common concern to many of the member companies.

It will also ensure that ARPEL and its member companies will be in a favourable position to collaborate with industrial and non-government organizations worldwide in the global development of standards for the effective application of environmental protection measures in the petroleum industry.

3.0 GUIDING PRINCIPLES

The basic principles for the effective and efficient implementation of an environmental impact assessment process are as follows:

- To integrate environmental and social considerations into the development planning process at the same time that other economic, financial, technical and engineering factors are introduced.
- To evaluate and assess project-environment interactions and identify potentially unwanted or adverse effects before they occur.
- To develop suitable mitigative measures designed to reduce or eliminate adverse environmental effects.
- To allow the identification of potential major adverse effects to play an important role in the decision-making process as to whether or how to proceed with project implementation.
- To develop and implement monitoring programs designed to (a) measure the accuracy of impact identifications and their magnitudes as well as (b) the effectiveness of any mitigative measures introduced to minimize unwanted environmental effects.
- To record the principal conclusions of the environmental review process in a clear, objective manner.
- To conduct the entire environmental impact process in a way that allows ample opportunities for public input and review.

4.0 COMMUNITY AWARENESS

The commitment of the ARPEL member companies to develop an appropriate public participation process for proposed company operations is contained in the "Community Awareness" section of the "Code of Environmental Practice". It is also an important cornerstone of the "Environmental Code of Conduct".

The adoption and implementation of an environmental impact assessment process, with expressed provision for public review and comment, is perhaps the most practicable means of demonstrating the importance that is attached to these commitments.

As stated previously, public opinion has had a very profound influence on the evolution of the environmental impact assessment process. In many parts of the world, the enabling legislation for the introduction of environmental review procedures was developed as a direct result of increased public awareness and concern relating to both environmental and social issues. In response to public pressure, the scope of the review process has been continually expanded to include community and social considerations, aesthetics and quality of life as well as the more traditional biophysical components. This complex intertwining of social and environmental issues is perhaps most evident in situations where proposed developments are seen to impact on the cultural and economic values of indigenous peoples with a strong tradition of renewable resource harvesting pursuits.

Perhaps the most striking example of the influence of public opinion on the environmental impact assessment process is the degree to which a requirement for public participation has been incorporated into the legislation. Some jurisdictions adopt an informal approach in which the company (proponent) is required to document the steps it has taken to solicit public input. In extreme cases, however, and usually those in which the project is anticipated to have significant adverse effects on the natural environment and human health and safety, the legislation provides for full-scale public hearings in quasi-judicial settings, and the provision of funds to cover the costs of public participation in the hearings. It is within these legal settings that numerous environmental and special interest groups have become most proficient in focusing public attention not only on environmental concerns but any inadequacies in the review procedures themselves.

Comparatively few projects are characterized by environmental, social, public health and safety concerns that would warrant a full-scale review and public hearings. In part it reflects an increased acceptance of the need to address these concerns at the corporate level and early in the planning process. It also reflects the widespread and increasing use of environmentally sound operating procedures including the development and adoption of proven and effective mitigative measures.

It also represents in part a maturity of the public participation process. In the majority of cases, the concerns and aspirations of local communities can be readily accommodated in project scheduling and design. This is much more likely to occur when public input is obtained in the early stages of project planning. An open program of information exchange also helps to keep the public perception of potential concerns in perspective by allowing them to be based on a certain level of technical understanding of the projects.

In summary, the devotion of suitable time and effort to the development of a public participation process can reap many rewards with respect to project planning and implementation. It is strongly recommended that the ARPEL member companies reinforce their commitment to the community awareness concept by developing some common minimum acceptable standards for the public information and consultation process. It is also recommended that, where appropriate, ARPEL member companies assist in the promotion of increased environmental awareness in the general public through cooperation in the design of environmental programs for educational institutions.

5.0 DESCRIPTION OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

Environmental Impact Assessment is the orderly and systematic evaluation of the potential environmental and social effects associated with development projects. Although emphasis is frequently on the adverse effects, and a desire to eliminate them to the maximum extent practicable, it should be recognized that some impacts can be positive or beneficial. Every project should attempt to introduce or "optimize" positive benefits, where possible. For example, the employment and business opportunities that can accompany project development may constitute positive impacts under appropriate conditions. Positive impacts are usually introduced to compensate for negative effects. Since these are typically as compensation, they frequently do not completely eliminate concern over the negative aspects.

The following paragraphs set out some of the general conditions governing the application of environmental impact assessments.

The EIA process is very much a planning tool designed to integrate environmental and social factors into the decision-making process. Environmental considerations are part and parcel of each step in project planning and, in conjunction with economic, financial and technical factors, are given due emphasis in the evolution of project design.

It follows that if the EIA process is to be effective as a planning tool, it must be introduced in a timely and efficient manner to the decision-making schedule. Environmental and social considerations should be an important part of the entire project planning process from the initial conceptual stages through design, operation and eventual abandonment. It is an ongoing process in which environmental and social information is fed into the overall project management plan.

At each step, project options and design alternatives are carefully weighed and appropriate measures are introduced to minimize or eliminate any undesirable effects that could lead to any unnecessary deterioration in environmental quality.

The EIA process results in the application of a set of values that place a high priority on the conservation and enhancement of the natural environment. It is a process that seeks

to influence how, when and where economic development takes place in a manner that is compatible with the principles of environmental conservation. It provides a natural focus for the application of many years of collective experience in the design of approaches and measures that have allowed similar types of development to proceed in an environmentally-safe manner. Although the EIA process seeks to influence rather than constrain economic development, there are occasions when constraint may afford the only practical alternative to the introduction of undesirable environmental effects. A sufficiently-high priority is assigned to environmental and social values in the EIA process that, in certain cases, the potential adverse effects may be considered to be so unacceptable that development projects should not be allowed to proceed.

The application of the EIA process must contain a built-in mechanism that allows for streamlining without compromising its basic principles. Scoping procedures are necessary to balance the degree and intensity of its application against the most probable sensitive and complex of the environmental and social concerns associated with various types of petroleum projects. Criteria can be established to assist in the identification of activities that can be accelerated through the environmental review process, and those that will normally require much more in-depth analysis and extensive public consultation. Project size and complexity is usually one criterion but is not necessarily the single most important. For example, the drilling of an exploration well in an ecologically-sensitive area would require more detailed review and consultation than a similar level of activity in more environmentally benign areas.

As indicated in the preceding section on Community Awareness, the EIA process must be applied in an open manner that provides ample opportunities for public scrutiny and review. The process must not only be fair but it must also be seen to be fair. The public perception of environmental and social concerns, and community aspirations, are all important factors to be considered throughout the assessment. An open policy of communication and information exchange is the most beneficial means of identifying and responding to these concerns. At the same time, the information exchange guards against the introduction of unwarranted fears and misconceptions based on an inadequate understanding of the technical aspects of projects. It is also worthwhile repeating that a failure to implement public consultation procedures can only serve to create doubt and

discredit the value of the EIA process no matter how diligent the company has been in integrating environmental factors into the decision-making process.

6.0 BENEFITS OF ENVIRONMENTAL IMPACT ASSESSMENT

It is probably not an overstatement to say that the initial reaction of Canadian industry to the introduction of environmental assessment legislation was one of reluctance rather than enthusiasm. The need to obtain regulatory approval of environmental programs and review the effects of projects was initially viewed as yet another regulatory hurdle to be overcome in seeking project approval from government authorities, as well as an additional use of funds adding to project costs.

The concept of environmental impact assessment has received significantly more acceptance over the years, and not simply because of the legal implications of non-compliance. There is abundant evidence that good environmental practice often makes good economic sense. The assessment process is usually cost effective and studies have shown that, even for large projects, the cost of assessing impacts on the environment averages less than 0.5 percent of capital costs. These costs are much less than those that would be incurred when the failure to address the environmental and social concerns can necessitate expensive modifications to project design and lead to costly delays in scheduling.

Public opinion can have an extremely important role in shaping environmental attitudes in both government and industry. Increased public awareness of environmental concerns has quickly led to the establishment of the principle of the preservation of environmental quality as a high priority. Neither government nor industry can afford to ignore these opinions or fail to respond to these pressures. The adoption of environmentally-safe policies and measures at the corporate level can have an important effect on company image and credibility and their public acceptance. Although it can take time to develop and build an image of credibility it can be destroyed very rapidly. Companies whose operations contribute to a deterioration of environmental quality can quickly lose any sense of credibility and find themselves subject to intense adverse public opinion. The task of improving a tarnished image and regaining public acceptance can be both long and arduous.

In addition to the demonstrated cost effectiveness of environmental assessment when applied correctly, and the positive contribution that it can make to corporate credibility,

recent developments have added yet another consideration. There is now an increasing trend to ensure that international aid and financial assistance programs are also subject to environmental review procedures. International organizations and financial institutions (through their supporting member countries) and national governments have become subject to the same public pressures in their international endeavours as they have at the domestic level. Public sensitivities have been focused on the need to address environmental concerns in a global context and to seek international solutions. The aim is not to impinge on areas of national sovereignty or to impose an environmental consciousness from outside. Rather it seeks to promote and foster environmental protection policies and procedures to the extent that they can be adopted in a cost-effective manner in development projects. Environmental protection requirements are now established as one of the criteria to evaluate the level of assistance to be provided for international development projects.

Finally, it is obvious that where the need to carry out environmental impact assessment is required by law, failure to comply can result in court action. Any such actions can be expected to be both lengthy and costly. The adverse publicity that accompanies litigation can also have a serious negative effect on company credibility.

7.0 CORPORATE ORGANIZATION

A strong corporate commitment to the implementation of an environmental impact assessment process will require the allocation of appropriate manpower resources and the development of a suitable organizational structure to implement the necessary procedures. Since the EIA process is most effective when introduced at the conceptual planning stages of project development, it is important that the structure of the environmental management team provide for effective representation at most management levels in the decision making process. Trained and experienced environmental staff should also have sufficient numbers to provide a timely and efficient service to all operational departments of the petroleum company. Clear lines of communication, reporting relationships and areas of responsibility should be established to ensure that the review of environmental and social considerations are integrated into all aspects of company operations.

The environmental management staff should play a key role in the public participation process used to identify and focus on significant environmental and social concerns.

Environmental personnel should be responsible for the assembly of background data on the natural and human environments, and the interpretation of this data for impact assessment and the development of mitigative measures. They should also play a key role in the identification of information deficiencies and the need to undertake environmental studies.

Environmental consulting and environmental engineering consulting companies are often engaged to carry out site-specific studies necessary for the detailed assessments of some projects. In these situations, it is essential that the relative roles of the consultant and company staff be kept in perspective. In-house environmental management personnel must assume full responsibility for the identification of the study requirements and the development of the terms of reference for these studies. Consultants may provide assistance in the development of suitable terms of reference. It is also important that the environmental management staff liaise fully with the available expertise in government departments in the development of the terms of reference for any environmental studies, especially where the preparation of the assessment is to serve regulatory requirements.

The extensive use of consultation, and the retention of control over the process, will help to make certain that the environmental studies focus on the assessment needs and do not result in the collection of vast quantities of data that are of marginal relevance to project requirements.

Just as it is important that company environmental personnel assume complete responsibility for the identification of study requirements, it is equally important tat they assume an equal role in the interpretation and application of the findings in the EIA process. Companies must be, and be seen to be, 100 percent answerable to and responsible for the statements contained in an environmental impact assessment report.

It is recognised that the ability to implement and maintain effective control over the EIA process will require an allocation of manpower resources. The staffing requirements among individual ARPEL member companies will vary according to the range and complexity of company operations. A minimum in-house environmental management capability would consist of a senior manager with formal training in environmental sciences, knowledge of the petroleum industry, and a sound knowledge of EIA methodology and procedures.

Additional environmental expertise would, ideally, include professional representation from one or more of the following disciplines: geology/geomorphology; geohydrology; meteorology; botany/ecology; wildlife biology; aquatic biology; land use; and socio-economics. A decision as to which disciplines should be represented on the environmental management team would be based primarily on the relative frequency that specific expertise is required to address the more significant environmental and social concerns associated with company operations.

Similar types of expertise can be obtained from the environmental consulting companies to augment the in-house environmental management capability. In such cases, it is important to review the credentials of the consultants in terms of their professional qualifications and reputation among peers, knowledge of EIA procedures and previous experience with similar types of project.

It is recommended that ARPEL provide assistance to each member company to identify the minimum and optimum levels of in-house environmental expertise needed to meet the implementation of the EIA guidelines. It is also recommended that ARPEL consider the establishment of a central core of expertise to assist in the initial stages of application of the guidelines by the member companies.

8.0 LEGISLATIVE TRENDS IN ENVIRONMENTAL IMPACT ASSESSMENT PROCESSES

The concept of environmental impact assessment has been widely adopted into the legislative and regulatory procedures for many levels of government. In some jurisdictions new legislation was specifically introduced in the form of Environmental Assessment Acts. In others the EIA requirements were incorporated into existing legislation and became part of the broader planning process. Irrespective of the method selected, the legal specifications are usually part of a regulatory approvals process, and state when assessments must be undertaken; who is responsible for their implementation; the scope, content and timing of the process as well as the requirements for public consultation.

The legal requirements to conduct environmental impact assessments vary among ARPEL member countries, and it is not intended to debate the merits of legislation. The purpose of these guidelines is to describe a set of procedures and a planning process that can be adopted by member companies whether or not there is any legal obligation to do so. The spirit and purpose of the EIA process can become an integral part of company policy requiring a self-assessment of environmental and social effects associated with all company activities. The degree to which these guidelines are successful in controlling the undesirable environmental effects could conceivably be reflected in a significant level of company autonomy or in a need to introduce and implement more appropriate legislation.

Although the emphasis is on self-assessment and self-administration of the EIA process, it is neither practical nor prudent to ignore the potential legal context. For those ARPEL member companies for which the need to undertake assessments is already a requirement of law, the details of the EIA process must be adapted to address these needs.

In other countries, where specific legislation governing the need for the environmental reviews of projects is under active consideration, it is most important that the companies participate constructively and cooperatively in the development of these laws and regulations.

Since the EIA process addresses a complex assortment of environmental and social concerns, it is most probable that its implementation may be influenced by other statutes.

This may be particularly important with respect to social considerations and any government policies that may be in place.

One of the most important legislative factors that can affect the implementation of the EIA process is the potential for overlapping jurisdiction. Focused attention on environmental concerns is relatively new. New legislation has been introduced and existing laws have been modified, sometimes on more than one occasion, by several levels of government.

The resulting problems for the implementation of the EIA process are essentially twofold. Firstly, the introduction of similar types of legislation at the federal (national), provincial (state) and even municipal levels can often lead to an overlap of jurisdictional responsibilities and confusion as to which set of procedures has priority.

Secondly, because the actual EIA legislation tends to be relatively recent, it sometimes overlaps with older existing statutes. Some of these statutes may deal with the protection of specific components of ecosystems (e.g. wildlife, fish, etc.) or particular areas (e.g. national parks). Others may relate to boards or utilities established to regulate specific types of development (e.g. pipelines, electrical transmission facilities and/or power generation), with their own independent responsibilities to address the environmental effects of projects falling under their immediate jurisdiction.

The degree to which these problems may affect the application of an EIA process in each of the ARPEL member companies is not known. The potential for them to exist should be examined as should the possibility of them being introduced where new legislation is being considered. The problems noted above are not insurmountable, but it is important that they be identified and recognized in the early stages of project planning. The primary effect is a potential negative influence on the smooth, efficient implementation of the EIA process resulting in unnecessary confusion and duplication of effort.

Where a potential exists for disputes relating to jurisdictional responsibility, it is essential for the companies to bring together all the interested parties at the beginning of project planning.

It is important to gain consensus on a single responsible regulatory approach and a mutually acceptable understanding of the scope and procedures to be used in carrying out the assessment, the format of the report and the provisions to be made for public comment and review. Once the common goals and objectives have been established the systematic planning and scheduling of the assessment process can begin.

9.0 SCOPING OF THE ASSESSMENT PROCESS

The concept of scoping was introduced in the United States in the mid 1970's to provide a much needed structure and focus for the environmental impact assessment process.

Prior to this time, impact assessments were often characterized by a "shot gun" approach" and contained data on a wide range of topics that were of little or no relevance to the assessment process. Companies were encouraged to collect data on all components of ecosystems, at times indiscriminately. Voluminous texts were produced to present the findings, but relatively few pages were devoted to impact identification and prediction. Not only did many of the early documents lack focus, they were expensive to prepare, laborious to review and had proportionately little effect on the environmental soundness of the decision making process.

For these reasons, the EIA process suffered a serious lack of credibility in the business, public and scientific communities.

The scoping process attempts to restore the credibility by focusing the emphasis on significant issues. It recognizes implicitly that it is neither possible nor practicable to examine all the potential interactions between every facet of project activity and every component of the natural and human environment. Common sense and collective experience dictate that many of these interactions are insignificant or even inconsequential.

Scoping was introduced as a potential means of eliminating the unimportant concerns and focusing on the real or significant issues. It is an aid in streamlining the assessment process by identifying those issues that are most important from a variety of perspectives which may include local residents, community leaders, landowners, businesses, environmental or special interest groups and native organizations. Once consensus has been reached on the importance of the issues, the focus of the EIA process is immediately directed towards the collection of data, analysis and development of a predictive capability for each and incorporation of the results into the project design.

Scoping is a process that seeks to identify the important issues and alternatives that should be examined in the preparation of an environmental impact assessment. Its aim is to establish a consensus of opinion on which features of the environment are important or of value to society. This consensus must take into consideration the inherent diversity in values and interests of a pluralistic society. It may go beyond a basic consideration of the way in which natural resources are managed and utilized to include such things as the quality of life, aesthetics and even questions of a moral or ethical nature. All of these factors can be involved in determining the significance of concerns to the residents of communities affected by proposed developments.

The Valued Ecosystem Component (VEC) is a concept that can be used to describe those features of the natural and human environment that are most valued by society. Examples of VEC's include the following:

- areas that are valued for their natural beauty and aesthetic properties (parks, wilderness areas)
- areas of scientific or historical value including archaeological resources.
- rare and endangered species and their habitats
- critical habitats required for the maintenance of wildlife populations.
- species that are hunted or fished by local populations and/or sportsmen
- the culture, quality of life and lifestyle of indigenous peoples.

The list is by no means comprehensive but it illustrates the broad range of factors that can enter into the determination of the value of the environment to various segments of society.

VEC's can only be established through constructive participatory discussions. All directly and indirectly affected parties with a significant interest are invited to review the proposed development from their particular perspectives. Mutual respect must be accorded to each point of view. The discussions must take place early in the project planning process. Several meetings may be required to gain a consensus on the significant environmental and social issues of concern. Any needs for additional information, as well as requirements for any special mitigative measures, must be identified early in the planning process to allow their integration into the project design.

The effective use of the scoping process can obviously result in a more efficient use of time and resources in impact statements. Potential adversarial situations can be eliminated or reduced. There is less likelihood that significant concerns will be overlooked. The opportunities for constructive input to the decision-making process, coupled with the evidence of corporate recognition of their concerns, can create much greater public confidence. The net result is that the efficiency and credibility of the EIA process can be enhanced considerably. It can be demonstrated to be not only as a practical means of protecting the natural and cultural environments but, at the same time, an efficient mechanism facilitating the smooth implementation of development projects that are environmentally well designed.

10.0 IMPACT IDENTIFICATION AND EVALUATION

Similar types of project are usually accompanied by similar forms or categories of environmental effects. Each project, however, has the potential to produce a unique range of impacts that can differ in size, kind and importance. These differences reflect either some detail of the project design or the particular qualities of the local natural and human environment in the vicinity of the proposed development. The primary function of the environmental impact assessment process is to identify, interpret and evaluate the range of project-environment interactions for each specific development proposal.

Identification of Impacts

Several methods have been developed to assist in the identification of the potential impacts of projects on the environment. These include checklists, map overlays, matrices, networks, computer models and public consultation.

Checklists are one of the simplest methods of identifying project-environment interactions recognised to have the potential to introduce adverse environmental effects (e.g. clearing of vegetation, stream crossings, etc.). Alternatively, the lists can be made up of the environmental components affected by these same types of activities (e.g. wildlife habitat, fish passage, recreational pursuits, etc.). In its simplest form, the checklist merely serves to highlight the range of factors to be considered in the assessment process. As in many identification methods, however, a measure of the potential significance of the interaction can be given rather than its mere presence or absence.

Map Overlays are perhaps the simplest visual technique used to identify potential impacts in a spatial context. They can be of particular value in the conceptual planning stages of project development. Preliminary project design information showing the proposed location of facilities, rights of way, etc. can be superimposed on maps showing ecologically-sensitive features or other valued ecosystem components. The level of flexibility in the design can be examined in attempts to eliminate these significant project-environment interactions. The process can be repeated throughout the project planning to examine the feasibility of design alternatives as a primary mitigative measure.

Matrices are visual representations of the interrelationships between two sets of interdependent factors. One axis usually portrays the project activities subdivided according to the phase of development (e.g. construction) and the type of operation (e.g. clearing, road construction, etc.). The other axis usually lists the components of the natural environment (e.g. fish, wildlife, water quality, hunting areas) or the types of environmental effects that can be introduced (e.g. siltation, loss of habitat, loss of livelihood).

The individual lines or rows of the matrix provide a useful summary of the collective aspects of the project that can have a cumulative influence on specific components of the natural and human environments. The number of human interactions with each component (e.g. water quality) provides a crude measure of its potential significance in the assessment process and highlight the need for mitigative measures. The significance of specific interactions can also be emphasized by the development of a suitable ranking system.

Matrices can be expanded or contracted as the assessment progresses. They can be applied to the project as a whole or to individual phases of the project. In the initial planning process the list of parameters on each axis may be extensive to make sure that potential effects are not overlooked. This will inevitably also lead to the identification of project-environment interactions that are of no real concern. The application of evaluative criteria can lead to a contraction of the matrix to focus on the significant effects. For example, only the valued ecosystem components may be identified on the axis as opposed to an exhaustive listing of all components of the environment.

Networks are visual methods of demonstrating the linkage between activities and environmental factors including cause and effect relationships. One of the limitations of matrices is that they are two-dimensional and they do not readily reveal interrelationships between environmental components on the same axis (e.g. water quality and fish habitat). Likewise, they do not reveal the potential secondary or indirect effects of project activities. Networks can provide a visual representation of these interrelationships. For example, the combination of activities that can lead to the deterioration of habitat, the range of impacts on individual species populations, and the loss of recreational potential or

livelihood associated with the harvesting of these species.

Computer Models involve more sophisticated techniques for identifying project-environment interactions. They have the additional advantage of introducing a significant predictive capability. Since they require that the inputs be readily quantifiable, the range of their applicability is often limited in scope to examinations of specific effects.

Simulation models can be effective tools in the design of environmental protection structures or the prediction of the spatial distribution of effects. In the absence of detailed streamflow records, climatological and other hydrological data can be combined with drainage basin or watershed characteristics to project drainage requirements for surface runoff, flood control and/or protection measures, or the details of culvert sizes needed to allow unobstructed stream flow and fish passage.

Climatological and hydrological data are frequently combined with process design information to develop dispersion models to predict the spatial distribution and concentration of contaminants in air or water. In areas where concentrations may reach unacceptable levels, the results can be introduced to identify design standard changes as a mitigative device (e.g. stack heights and gaseous emissions in refineries).

Consultation is an important mechanism for identifying project-environment interactions and is the only method that accommodates a wide range of perspectives in the identification process. People can identify dependencies on natural resource utilization and community values. As discussed in the section on scoping, they can be particularly important in the identification of significant concerns, and the provision of a focus for the assessment process.

Evaluation of Impacts

Once the potential effects of projects on the human and natural environment have been identified they must be evaluated. These evaluations involve consideration of their size, scale, duration and significance.

Unfortunately it is seldom possible to use precise numerical values to describe exact project effects on the environment. Frequently the data used to define the existing state of the environment lack sufficient detail to allow precise pre- and post-project comparisons and the development of a scientifically-based predictive capability.

Certain exceptions do occur as in the case of effects on air, soil and water quality where specific standards or criteria can be established against which changes may be measured. For the majority of biological factors however the existence of cyclical phenomena and extraneous or non project-related influences preclude this level of accuracy in either the measurement or prediction of effects.

For much of the EIA process the impact evaluation standards are subjective rather than objective. Informed judgement and professional expertise afford the most commonly used criteria for a subjective, descriptive ranking or rating of environmental effects. In some cases, it may be able to assign some quantitative value as long as the criteria on which it is based are clearly specified and agreed upon. For the most part, however, it may be preferable to adopt a descriptive system of evaluation rather than introduce quasi-quantitative weightings designed to enhance the validity and conclusions of the assessment. These quantitative values are seldom capable of withstanding rigorous analysis and critical review, and can often serve to discredit rather than improve the quality of the assessment report.

Typical terms used to describe the magnitude, scale, duration and direction of impacts are as follows:

MAGNITUDE	**SCALE**	**DURATION**	**DIRECTION**
Negligible	Site-Specific	Short-term	Negative
Minor	Local	Medium-term	Positive
Moderate	Regional	Long-term	
Major	National		
	International		

Qualifiers can be attached to some of these terms by way of definition e.g. short-term may be used to describe effects that only accompany particular actions and are removed when the activity ceases.

Significance of Effects

All natural and human environments have thresholds of tolerance for intervention or disturbance. Once these thresholds are reached or breached, the effects may be anything from a periodic or temporary perturbation of the system to complete breakdown. It is not always possible to specify these threshold limits. Hindsight all too often tells us when the limits have been exceeded, and the results are unacceptable, as in the appearance of chronic pollution levels or the extinction of species. Rare and endangered species designations reveal how closely threshold limits are being approached and the need to introduce preventative or remedial measures.

The significance of impacts is intimately related to the existence of these threshold limits even if they cannot always be identified precisely. It is largely reflected in the intuitive reasoning that is used to decide which effects are judged to be "acceptable" or "tolerable". The significance or acceptability of environmental effects cannot be determined without considering to whom or what they are significant. It is necessary to incorporate a number of value judgements from a variety of perspectives to establish the significance or acceptability of impacts, and this is the primary function of the scoping process described earlier.

11.0 MITIGATIVE MEASURES AND COMPENSATION

Once the nature of project-environment interactions has been identified, and the significance of the potential effects has been determined, it is almost always possible to introduce measures that can lead to a decided amelioration of the effects. These steps are collectively referred to as mitigative measures, and they can be applied to reduce, or even eliminate, potentially unwanted environmental and social effects. Compensation measures are usually considered only with respect to significant environmental concerns, and are applied in circumstances where mitigation is limited in its effectiveness.

Mitigation

Most projects have an inherent degree of flexibility in their design. A range of alternatives usually exists at various levels, and some of these alternatives have less adverse environmental effects than others.

Many mitigative measures reflect the timely introduction of environmental factors into the planning process. Others involve the selection of environmentally sound operating methods that have been demonstrated to be effective in similar activities. Yet others may require the development of innovative approaches to address the environmental sensitivities associated with specific projects. For the most part, however, it will be found that most types of projects have precedents in which particular mitigative techniques have been applied with success to ameliorate the environmental effects. The collective experience gained in monitoring the environmental and social effects of petroleum and other types of projects is one of the most effective tools in the assessment process. Examples of different categories of mitigative measures are presented in the following paragraphs.

Planning measures have already been identified as a means of identifying project-environment interactions in the conceptual stages of project design. The location of facilities and infrastructure away from valued ecosystem components can obviously lead to the exclusion of potentially significant environmental and social concerns. Similar concepts of avoidance can be applied during later stages of the planning process to address alternative design requirements needed to resolve sensitive issues. At a more detailed level, the judicious application of environmental planning to route selection can be

used to avoid areas of terrain instability or to provide undisturbed buffer zones between construction activities and bodies of water. Both of these measures can contribute to a lessening of the potential for erosion and/or siltation problems.

Planning measures also include an extension of the anticipation and prevention philosophy to the development of an emergency response capability for any accidents that may occur. Effective response plans will ensure that the unwanted environmental effects associated with these accidents will be limited in their severity.

Emergency response planning begins with a statement by senior management outlining the corporate commitment and priorities associated with the response. A senior coordinator must be identified to ensure that the development of a response capability is given sufficient attention and that the necessary expertise and resources are available for effective implementation of the plan. All aspects of company operations should be reviewed to determine where uncontrolled releases of substances into the environment could occur. Risk analyses should be completed to establish what can go wrong through a combination of either natural or human factors; what are the anticipated effects; and what are the probabilities of these events occurring and their frequency. As a result of the risk analyses, the potential hazards and the severity of their impacts on the natural and human environments can be established. It is also important that, in developing the emergency response plan for company operations, all appropriate legislation and industry codes of practice are examined, to ensure that full compliance is achieved.

The implementation of an emergency response plan requires that an organizational framework be established with details of responsibilities for individual personnel and a definite chain of command be in place. Specific equipment and logistics req uirements needed to control the upset condition, to contain the spread of contaminants and to initiate cleanup, should also be identified. Any outside resources of personnel and/or equipment that may be needed in the response should also be identified, together with procedures describing the conditions under which these outside resources should be accessed and mobilized.

Finally, it should be noted that an effective communication system is a critical component of any emergency response plan to ensure total coordination of the response effort.

Scheduling measures are another effective category of mitigative techniques to be considered in the timing of project activities. Many fish and wildlife species have critical stages in their annual life cycles that greatly increase their vulnerability to disturbances. These sensitivities may reflect reproductive stages (e.g. calving, nesting, spawning) or the use of critical habitats necessary for survival at particular times of the year. The avoidance of species/project interactions during these sensitive periods can be extremely effective in limiting the severity of the impacts of project activities on fish and wildlife populations.

Scheduling can also play an important role in determining the most appropriate time of year to conduct operations. Examples include the avoidance of rainy seasons for offroad vehicular activity or restrictions of summer operations in tundra environments in areas of perennially frozen ground. Scheduling can also be applied effectively to ameliorate social concerns as in the resource harvesting practices of some indigenous peoples.

Operational mitigative measures relate to the manner in which project activities are carried out. Examples include the various methods to restrict soil erosion, restrictions on the extent of cleared areas to the minimum amounts necessary, or the procedures adopted for stream crossings to avoid siltation. Details of these and other procedures can be found in the "Guidelines for Control and Mitigation of Environmental Effects of Deforestation and Erosion".

On a more macroscopic scale, operational options can influence the types of method employed in activities such as geophysical operations. It could include the examination of the applicability of hand-clearing methods as opposed to bulldozers in some ecologically sensitive areas; the potential use of helicopters as an alternative to vehicular operations to limit future access; or alternatives to the use of explosives and blasting techniques.

Technological mitigative measures include the use of control devices to prevent or restrict the release of deleterious substances into the environment. Examples include the use of filters and scrubbers to remove contaminants from gaseous emissions to the

atmosphere or the waste treatment facilities to process liquid and solid effluents. More details on the application of technological mitigative measures are contained in the "Guidelines for the Disposal and Treatment of Produced Water". "Guidelines for the Management of Petroleum Refinery Liquid Wastes", "Guidelines for the Management of Petroleum Refinery Solid Wastes", and "Guidelines for the Treatment and Disposal of Exploration and Production Drilling Wastes".

Restoration mitigative measures include procedures to reclaim disturbed sites and return areas closer to their original condition. These measures may encompass slope stabilization and recontouring techniques to restore such features as quarries or borrow pits; soil remediation and restoration methods to remove contaminants; or methods to enhance the re-establishment of a vegetation cover.

Management mitigative measures can be applied to the full spectrum of project-environment interactions. Management can fulfil a preventative role as in the placement of restrictions on firearms and fishing equipment to reduce potential hunting and fishing pressures by field personnel in sensitive areas. Similarly, restrictions can be introduced to prevent the unnecessary harassment of wildlife through the rigid control of flight paths and the maintenance of minimum flight elevations to avoid stress-related disturbances to animals.

Measures developed to protect the environment from unwanted effects are only as effective as the degree to which they are applied. The development of an environmental management plan and its rigorous implementation are key components governing effective mitigation.

Failure to implement the measures will lead to a corresponding failure to protect the environment.

Adequate education and motivation of field project personnel are important factors influencing the successful application of environmental protection measures. It does not really matter if it is careless disposal of garbage around campsites, the disposal of untreated effluents, or the failure to remove shot wire and plug shot holes along seismic

lines. The net result is the same: an undermining of the values of environmental considerations built into the project planning design and a tarnishing of the company's image and credibility.

In order to lessen the probability of non-compliance with the environmental protection plans, it is strongly recommended that project personnel participate in educational briefing sessions which emphasise and explain the needs and reasons for environmental protection. All personnel should be fully aware of the specific environmental and cultural sensitivities (especially Valued Ecosystem Components) in the project area and the need to protect them.

Compensation

It is recognised that it is impossible to achieve the benefits of economic development without some measure of change to the natural environment. The intent of environmental planning, and the application of the various mitigative measures, is to control the level of undesirable effects as perceived by society as a whole.

The residual impacts associated with projects are those unavoidable effects that remain after all attempts have been made to ameliorate them. They form part of the acceptable trade-offs of environmental factors to be offset by other forms of economic or social benefits derived from the projects. None of these residual impacts should represent a serious deterioration of the quality of the environment. On occasion, the acceptability of inevitable impacts may be offset to some degree by compensation measures. These commonly take the form of enhancement procedures in other areas such as the creation of wildlife habitat or improvements to fish habitat to offset losses incurred by stream diversion.

12.0 SCREENING AND THE ASSESSMENT PROCESS

Environmental impact assessments can vary greatly in both size and scale depending on a number of factors. These include the complexity of the development plan, the environmental sensitivities in the project area, and the predicted magnitude of the project/environment interactions.

The number of project/environment effects that can be identified quite reliably is often quite large. Experience shows however that only a relatively small proportion of these effects play an important role in a decision as to whether or not a project can proceed in an environmentally-acceptable manner.

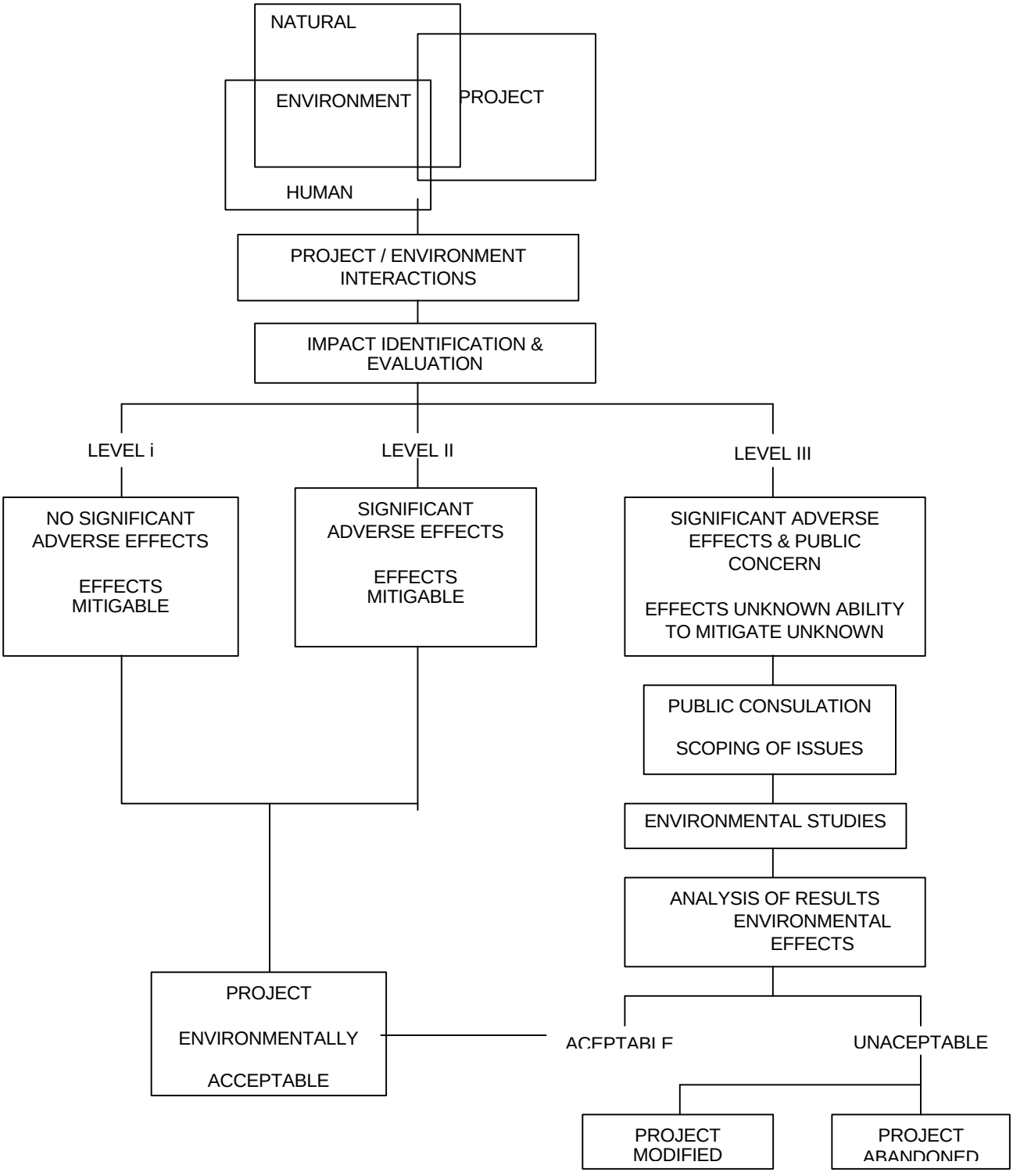
The primary skill in the EIA process is the ability to sift through the multitude of project/environment interactions and focus quickly on the presence or absence of any significant environmental or social concerns. This ability is crucial in determining the scope of the assessment process; the manpower and financial resources necessary for its implementation; the level of public consultation required; and the length of time needed to complete the investigations and its anticipated effect on project scheduling. The concept of screening has been introduced to aid in the determination of the needs of the assessment process.

Screening is a process in which the environmental decision making process proceeds in a sequential series of steps with milestones that reflect the ability to identify and ameliorate any significant effects of the project.

The process begins with the development of preliminary project design criteria and the assembly of all available physical, biological and social data for the project area (Figure 1). Environmental management team members use checklists, map overlays and matrices to identify all the project/environment interactions. A combination of professional judgement, intuitive reasoning and prior related project experience is used to evaluate the magnitude, scale and duration of the environmental impacts associated with the interactions.

FIGURE 1

THE SCREENING PROCESS



The identification of appropriate mitigative measures to eliminate or reduce unnecessary or unwanted environmental effects usually occurs at the same time that the specific interactions are identified. Discussions between environmental, management and project technical personnel will assist the review of the flexibilities in design parameters, operating procedures and scheduling needed for the development of suitable mitigative measures.

The identification of project/environment interactions, an evaluation of their effects and the development of suitable mitigative measures are the first essential steps in the implementation of any EIA process. Of particular importance is the ability to detect the potential presence or absence of any significant adverse environmental effects and the level to which they can be ameliorated by mitigation. This ability to identify any significant adverse environmental effect associated with the project is most central in determining the level of detail and public participation required for the completion of the EIA process.

In the hypothetical sequence that follows, three possible levels of assessment are described to represent the application of the screening procedures (Figure 1). For discussion purposes only these are identified as Levels I, II and III respectively.

Level I

The examination of the project/environmental interactions reveals that sufficient data exist to identify and evaluate the potential effects. No significant effects are identified. The application of proven operating methods will allow the project to proceed in an environmentally-safe manner. Public information requirements are low-key and informal and typically include local landowners and community officials. Attempts are made to enhance the positive effects of the project through the identification of local employment and entrepreneurial business opportunities. No further assessment is usually required.

Level II

The examination of project/environment interactions reveals the presence of a small number of potentially significant environmental and social effects. Most or all of these effects can be mitigated with known and proven technology. Limited site-specific environmental studies may be required to enhance the basis for a more precise evaluation of the effects.

Since a potential for the existence of significant environmental and social concerns exists, public consultation requirements become more important to make sure that all potential significant effects have in fact been recognized. In addition to local landowners and community officials it may be advantageous to schedule public meetings to provide a wider perspective in the identification of valued ecosystem components.

Projects falling into this category may usually be anticipated to be able to proceed with little or no delay in scheduling after the incorporation of additional environmental safeguards.

Level III

For projects falling into this category, the review of project/environment interactions reveals that it is not possible to evaluate the significance of the environmental effects. The reasons for this may include inadequacies or deficiencies in the existing environmental data base which make the effects difficult to identify and/or evaluate; doubts as to the efficacy of known mitigative measures to ameliorate the effects sufficiently; or it may reflect particular aspects of the development proposal that generate significant public concern.

Public consultation requirements become critical in projects of this nature. Meetings become much more structured in their organization, more frequent, and the range of viewpoints is more extensive. Scoping procedures assume critical importance in the identification of the significant environmental and social concerns and the establishment of the precise terms of reference for studies to examine these concerns in depth.

Study requirements may become extensive and take a lengthy period of time to complete. The results of the studies must also be subject to public review to scrutinize their contribution to the mitigation of the environmental effects and alleviation of public concern. The results may produce an assessment that the project can proceed with the incorporation of specific environmental protection measures. Alternatively, the studies may confirm that the anticipated environmental and social effects are unacceptable an the project should either be subject to extensive design modifications or abandoned.

The screening process allows the level of assessment to be related to the significance of the environmental and social concerns. Level I type projects, with no identifiable significant impacts, are subject to the least rigorous reviews in terms of the allocation of manpower, resources and time. They are effectively "screened out" and categorised as being environmentally acceptable at an early stage in the project planning schedule.

At the opposite end of the spectrum, Level III type projects require the greatest allocation of resources and time for the preparation of detailed assessments. It is highly desirable to be able to identify these categories of activities as early as possible in the planning process to allow the environmental requirements to be addressed and the potential implications with respect to scheduling identified.

The following types of projects are examples that may generate significant environmental and social concerns and therefore require detailed assessments.

1. Projects introducing significant social concerns relating to health and safety, loss of livelihood, quality of life, property values and questions of a moral or ethical nature.
2. Projects threatening valued components of the natural environment including parks, ecological reserves, sanctuaries, rare and endangered species, critical habitats and species of resource harvesting or recreational value. Areas of scientific, historic, cultural and archaeological value would also be included.
3. Large projects which by their very scale and complexity introduce pollution problems and pressures on communities (these may often be linked to the first category through social concerns and especially health and safety). Projects falling into this category include refineries, petrochemical plants, sour gas processing facilities, LNG and LPG facilities, heavy oil and oilsands projects, pipelines and offshore hydrocarbon developments.

13.0 COMPONENTS OF THE ENVIRONMENTAL IMPACT ASSESSMENT REPORT

Most environmental impact assessment reports have broadly comparable contents and formats. Typical components include each of the following:

- Overview Summary
- Project Description
- Description of Existing Environment
- Environmental Impacts
- Mitigative Measures
- Residual Impacts
- Environmental Monitoring Programs
- Public Consultation Procedures

The following paragraphs provide brief summaries of the types of information that should be included in a report under each of the above headings, and indicate where the principles contained in the preceding sections of this document should be applied.

Although all of the above components should be taken into consideration in any assessment of the environmental and social effects of petroleum activities, the scoping and screening procedures should be used to determine the level of detail to be presented in the report.

More detailed examples of actual guidelines for impact assessments prepared by the Canadian federal Environmental Assessment Review Office (FEARO) are presented in Appendix 1. They include generic guidelines for the assessment of oil and gas exploration production and pipeline projects, as well as the project specific guidelines for the detailed assessment of a proposed offshore oil development on Canada's Atlantic coast.

Overview Summary

The overview summary should be written in terms understandable to the general public and should focus on the significant environmental concerns of the project. It should contain a brief description of the project, the potential environmental effects, the mitigative measures to be implemented and the significance of any residual impacts.

Project Description

This section of the report should include a rationale of the purpose of the project including its relationship to projected oil and gas demand. In addition to onsite details, information should be presented on the need for ancillary developments such as any infrastructure requirements. Details should be provided of development plans, scheduling, the locations of any production or processing facilities, emissions and waste generation amounts, and contingency plans. The levels of detail and emphasis should reflect the specific activities or features of the project that can contribute to unwanted environmental effects during the construction, operation and abandonment phases of the project.

Description of the Existing Environment

The purpose of this section is to provide a summary of the features of the natural and human environments prior to project development. Topics to be considered include geology, terrain, soils, climate, water resources, vegetation, fish and wildlife, socio-economic parameters, land and resource use, and archaeological resources. Once again, it is important that the level of detail presented for each of these topics should be appropriate to its importance in the discussions of significant environmental impacts and the need to develop mitigative measures.

The results of any site-specific environmental studies carried out for detailed assessments of the significant concerns should be made available in supporting documents.

Environmental Impacts

The methods used to identify project/environment interactions should be described together with details of the scoping process used to determine the scope and focus of the assessment process.

The potentially significant adverse environmental impacts should be evaluated for the construction, operation and abandonment phases of the project. The discussion should focus on the magnitude, scale and duration of any significant environmental effects.

Mitigative Measures

This section should contain a discussion of the proposed mitigative measures to ameliorate the significant environmental effects that cannot otherwise be eliminated or avoided.

Residual Impacts

The residual impacts that remain after all feasible design alternatives have been applied, must be identified and evaluated in this section of the report. The rationale for any compensation measures to offset these unavoidable environmental effects should also be presented.

Environmental Monitoring Programs

Plans to monitor each phase of the development project should be presented as part of a comprehensive environmental management/protection plan. Specific proposals to monitor the accuracy of the methods used to identify and evaluate significant environmental and social concerns, and the effectiveness of the mitigative measures proposed for their alleviation, should be presented.

Public Participation

It is important to present a record of the measures used to solicit public input and review of the proposed project, and a summary of the concerns raised during the public consultation process.

APPENDIX 1

FEARO Environmental Impact Assessment Guidelines

- Oil and Gas Exploration and Production
- Pipelines
- Potential Offshore Oil Production

Issued by the Canadian Federal Environmental Assessment Review Office

GUIDELINES TO PREPARE AN

INITIAL ENVIRONMENTAL EVALUATION FOR

OIL AND GAS EXPLORATION AND PRODUCTION

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

OIL AND GAS EXPLORATION AND PRODUCTION

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NOTE: These guidelines are to include all land, water and marine based geophysical exploration, exploratory drilling, delineation drilling, production drilling for gas and oil, and gas plants.

1.0 OVERVIEW SUMMARY

The overview summary should be written in such a manner as to allow reviewers to focus immediately on items of concern. It should be written in terms understandable to the general public and in a format that allows it to be extracted directly for publication by the media (if this is required), or for use by senior executives requiring a rapid appraisal of the situation.

The overview summary should briefly describe the project, the probable significant environmental impacts, the ameliorating and mitigating measures to be implemented by the assessor, and the significance of the residual environmental impacts following amelioration or mitigation. Any aspects of the development which might stimulate public concern should be concisely described. The summary should also clearly identify data gaps or knowledge deficiencies, and the limitations they have imposed on the Initial Environmental Evaluation.

2.0 THE PROJECT SETTING

2.1 Declaration

The individual proponent(s) and/or Initiator(s) must be identified and take full responsibility for all statements and judgements in the Initial Environmental Evaluation.

If more than one proponent is involved, the responsibilities of each proponent should be clearly identified.

2.2 The Need

The Initiator should provide evidence of the oil or gas demand for the proposed development. The timing of the project should be outlined with respect to this expected demand.

This section should include the primary purpose of the proposed project and how the proposed action fits into federal, provincial, regional and municipal plans and requirements. Forecast curves reflecting existing and historic oil and gas demands and the location of these demands should also be outlined.

2.3 Alternatives

The Initiator should provide a description of the alternatives considered, including those rejected, in sufficient detail to allow the reviewer to comparatively evaluate the costs, benefits and environmental risks of the alternatives.

Extension of existing facilities where they exist and cancellation of the development or activity should be considered as alternatives.

2.4 Associated Projects

The Initiator should identify all projects that may be affected by the proposal and which in turn may cause environmental concern. Discuss the interrelationships of such projects and the environmental concerns identified whether or not these concerns fall within the jurisdiction of the proponent and/or Initiator.

The Initiator should also discuss the general, long-term, probable spin-off developments or activities resulting from the proposal in terms of their environmental effects.

3.0 THE PROPOSAL(S)

All viable alternatives not discarded in 2.3 above should be discussed under each of the following headings. Factors common to all viable alternatives may be discussed first followed by a description of the factors peculiar to each individual alternative.

3.1 General Layout

a) The legal site description and at least two maps should accompany the Initial Environmental Evaluation. The first map should be of a standard small-scale showing the proposed development or activity in relation to geographic and environmental factors. The second map should be an orthophoto or bathymetric map of an appropriately large scale to provide more detail of the specific development area.

b) The application submitted by the proponent should also justify the extent of the lands applied for with due consideration to minimizing disturbance to the environment.

c) The development plan should include existing features such as the oil or gas permit area, the location and status of wells within the permit area, and all leases, acreages, roads, airstrips, borrow pits, buildings, camps, staging and storage areas, and ports or marine terminals.

d) The development plan should include proposed project features such as pipelines, well sites, plant sites, campsites, borrow pits, roads, airstrips, water sources, waste and sewage disposal sites, sumps, fuel storage areas, supply-staging areas, ports and marine terminals, connections to twin pipelines and all other facilities inside and out of the lease area, and proposed geophysical shot lines.

e) Schematic diagrams for all processing plant facilities and exploration or production wells should include the plant(s) or well site(s), camp and storage site; the relative locations of camp facilities, waste and sewage disposal areas, water supplies, storage areas for fuels, chemicals, explosives, construction materials, dykes and roads.

3.2 Construction Details

The following items should be described in concise terms:

a) The method(s) and timing of construction for each part or phase of the proposal.

b) The location, volumes required, and method of acquisition of local construction materials or services such as borrow pits, quarries, water supply, waste water disposal, gravel, dry dock facilities, housing and any other such requirements of the proposed type of development or activity.

c) Location and other details of access roads, increased use of existing roads and other transportation facilities.

d) Location, size, duration and services of construction camps or operational camps such as geophysical field crews.

e) Interruption to natural physical processes such as river flows or lake levels in terms of timing and other pertinent variables.

f) Any effluents and emissions in terms of quantity and characteristics, and noise or aesthetic factors caused or attributable to construction.

g) The location, method of construction, dredging requirements and scheduling for any ports and freshwater or marine terminals.

3.3 Operation and Maintenance

The following items should be described in concise terms:

a) The important timing and other commissioning details of the proposal.

b) The aesthetic features of the project.

c) Any interruption to natural physical processes such as river flows, groundwater regimes, lake levels, ice movements, etc., caused by the operation in terms of timing, space and magnitude.

d) Changes in the use of transportation facilities in terms of volumes and frequency of operation.

e) Expected releases, discharge of stockpiles of waste or toxic substances used or generated during all phases of the proposal with the identification of potential air, land or water contaminants.

f) The quantity and quality of liquid and solid by-products of drilling and production activity, their storage, disposal and ultimate fate.

g) Methods of waste disposal to avoid health hazards to humans and degradation of the environment.

h) Information should be provided on water requirements from streams, springs, lakes or marine waters including volumes, seasonal times of extraction, treatment and disposal for domestic, camp or operational purposes.

i) Location of camps and sewage disposal systems, sewage treatment facilities, anticipated disposal rates relative to receiving waters or drainage patterns.

j) The composition, volume and method of handling and disposal of solid wastes should be provided.

k) The nature, transportation, storage, use, treatment and final disposition of any pesticides, herbicides, pipe coating materials, anti-corrosion materials, flushing agents, testing fluids, special lubricants and other toxic substances proposed for use in the project and information on their expected persistence, mobility and ultimate fate in the surrounding ecosystem.

l) Quantities and qualities of atmospheric emissions such as sulphur compounds, hydrocarbons, nitrogen oxides, water vapour, heavy metals, thermal emissions and any other potential pollutants produced during all phases of the project.

m) The quantity and quality of other atmospheric emissions such as dust, noise and odour produced by H_2S and other by-products of the proposal.

n) Contingency plans describing:
   i) How the possible loss of oil or gas through exploration, production or storage systems would routinely be detected and stopped. The maximum undetected loss from any phase of the operation should be calculated (this value should be as low as technologically feasible).
   ii) How oil, gas or other substances that may be toxic which have escaped into the environment would be detected.
   iii) Methods of fire prevention, detection, and suppression on the development, in the immediate area surrounding the development, on the right-of-way, and on lands involved in ancillary activities during construction, operation, and

abandonment of the proposal.

iv) Plans for countermeasures against the spread and effects of oil, gas and gas condensates and of other possible pollutants. These descriptions should be based on various scenarios of seasons and vagaries of the weather.

v) The expected interface with existing or proposed contingency plans which are, or will be, the responsibility of other companies or agencies in the area.

vi) Where applicable, the capability and timing required to drill a relief well; availability of extra well-head control equipment and its utility; inventory and locations of containment, clean-up and disposal equipment.

vii) The roles and responsibilities of all personnel; government responsibility centres and established reporting procedures.

viii) Where applicable, the various possible configurations in which a well could be abandoned temporarily; associated with these options state the minimum advanced warning times and times required for reconnection before drilling can be renewed.

ix) The educational program for field personnel.

o) Where applicable, the drilling rig and platform covering such items as performance history, capacity, B.O.P. equipment and procedures, design against environmental threats (e.g. moving ice, storm surges, sub-bottom frozen materials, etc.), site position maintenance equipment, navigation and/or communication equipment, and qualifications of the drilling crew.

3.4 Abandonment

Plans for abandonment should include:

a) What equipment and facilities, including camps, will be removed when the proposal is terminated, abandoned temporarily or permanently abandoned, how they will be removed and how the area will be reclaimed and/or stabilized.

b) The disposal and reclamation of gravel pads and roads to prevent interference with natural drainage systems or water bodies.

c) Contingency plans concerning the release or loss of any gaseous, liquid or solid contaminants.

d) The ultimate disposal of organic and/or mineral waste materials that were stabilized during the construction and operational phase.

4.0 DESCRIPTION OF THE EXISTING ENVIRONMENTAL AND RESOURCE USE

This section should describe the environment as it exists prior to project development with emphasis being placed on the environmental components that are of particular significance to the proposal. Consideration should be given to both the immediate environment and ancillary areas that may be affected. Present resource use in the areas concerned should be described in qualitative and quantitative terms. Knowledge gaps should be identified where they exist.

It is suggested that this section be developed in terms of the following points:

4.1 Climate

Consider and discuss the following where applicable:

- Temperature in terms of daily and seasonal variations and extremes;
- Temperature inversions by type, frequency and intensity as they relate to dispersal of atmospheric pollutants;
- Winds in terms of velocity, frequency, direction and duration of critical wind speeds;
- Precipitation in terms of kind, amount, duration and frequency;
- Incidence of fog in terms of kind, duration and frequency;
- Incidence of meteorological phenomena resulting from a combination of components such as wind chill, drifting snow or freezing rain;
- Air quality and air pollution potential;
- Climatic factors should be considered relative to the proposal in terms of such aspects as snow loads, structural icing, structural design relative to wind or ice stress, demobilization of equipment by icebergs, low ceilings and/or visibility associated with fog, cloud or precipitation as factors influencing operational efficiency or emergency procedures;

- With respect to rivers, ponds, lakes or marine areas, climatic factors should be considered relative to the proposal in terms of such aspects as structural design relative to ice stress; wind drift of ice and the movement of toxic substances in open water leads, cracks, under ice and entrained within the ice; the predictability of wind-driven surface currents, the predictability of wind-waves related to the emulsification of oil or other toxic materials; extreme waves relative to inundation of drilling platforms, service vehicles and staging areas; extreme storms relative to security of drilling platforms, service vehicles, support vehicles and staging areas; an estimate of wave spectra or periodicity which produce the maximum fatigue effects on drilling structures; internal waves related to possible buoyancy changes and natural vibrational periodicities of drilling-rig platforms; storm surges related to inundation of artificial islands, bottom-founded structures in shallow coastal areas or on low shorelines.

4.2 Terrain

Consider and discuss the following where applicable:

- The geology and landform parameters including bedrock, surficial geology, seismicity and mineral resources;
- The soils including composition, structure, nutrient levels, erosion properties, ice content, slumping and faulting properties;
- A rating of terrain susceptibility based on terrain performance after disturbance caused by the proposal;
- The geomorphology and seasonal variability of shorelines, lagoons and estuaries relative to the physics of shoreline sediment transport;
- Land capability in terms of agriculture, forestry, wildlife, fisheries and recreation should be shown on a composite map.

4.3 Water

Consider and discuss the following subjects where relevant:

- Watershed characteristics such as relief and vegetative cover;
- Overland flow characteristics such as drainage channels and streams;
- Groundwater characteristics such as subsurface drainage patterns, water table, seepage and permafrost conditions;

- Quantity of surface water in the seasonal context recognizing seasonal peaks, floods, storm surges, break-up and freeze-up characteristics and ice jams;
- Seasonal stream characteristics for problem areas relative to stream flow, channel dimensions, slope, bank and bed characteristics, scour potential, and stream behaviour with respect to channel shifting;
- Seasonal quality of water for important aquatic habitat recognizing suspended sediments, dissolved oxygen, nutrient load, heavy metals, salinity, and hydrocarbons;
- Hydrology of low-lands relative to inundations by storm-surges, hurricanes, tsunamis and land run-off;
- Expected oceanographic parameters and their seasonal variability that will determine the probable transport of pollutants considering such aspects as the statistical expectation of ocean currents, ice movements, ice cover, extent of open water and wave action;
- Items such as moving ice, bottom scouring by ice sub-bottom frozen materials, wind waves and storm surges should be referenced to items 3.2 and 3.3.

4.4 Flora

Consider and discuss the following where applicable:

- Identify the terrestrial, emergent and submergent aquatic, intertidal and marine plant communities and evaluate their distribution and susceptibility to alteration;
- Species composition of vegetation, the communities involved in terms of relative abundance, ecological requirements and importance as fish and wildlife habitat and commercial significance;
- The effectiveness of different plant communities as insulators of permafrost.

4.5 Fish and Wildlife

Consider and discuss the following where applicable:

- Migratory and resident animal populations including fish, amphibians, reptiles, birds and mammals whose habitats are to be affected by the proposal, with emphasis on seasonally important areas, densities, and biological requirements;

- Fisheries (freshwater, marine and diadromous species), with emphasis on seasonally important areas, densities, migration habitats, spawning requirements, and sensitivities;
- Existing biological communities delineating sensitive areas, productivity and seasonal variations;
- The identification of any critical species which may be sensitive to the proposed development that act as important food resources for other co-habiting species;
- Identification of species that may be considered rare or endangered, commercially, scientifically or recreationally important;
- Historic trends in the use of the area by animal populations, particularly those of direct or indirect importance to man;
- The capacity of biological systems to assimilate possible pollutants resulting from the proposed development or activity;
- The identification of potential problem wildlife with particular reference to those that may be dangerous to man;
- Predevelopment levels of potential environmental contaminants in the physical and biological components of the environment.

4.6 People

Consider and discuss the following where applicable:

- The distribution and characteristics of the human population including such aspects as life patterns, communities, employment, public facilities and housing, among others;
- Cultural, social and economic setting of the general area, with recognition of resource use and the natural environment;
- The expected population changes resulting from people moving into and out of the area of proposed development.

4.7 Land and Resource Use

Consider and discuss the following where applicable:

- Characteristics of the human population dependent on the resources of the area to be affected;

- Existing land and resource use in the area of, and influenced by, the proposed development and ancillary activities;
- Areas of special status such as ecological reserves, native land reserves, villages, fishing stations, hunting and gathering areas, areas of archaeological, historic or paleontological significance, areas of religious or cultural importance;
- Existing or potential recreational use of land and resources;
- Aesthetic features of the area, especially those which are unusual;
- Ownership (public, private or special status) of adjacent lands;
- Status of regional plans including projected changes in supply and demand for land and water;
- Projected urban and regional development.

5.0 ENVIRONMENTAL IMPACTS

Significant environmental effects should be discussed by issue in this section. Describe the potential impacts, the amelioration and mitigation measures proposed and define residual impacts of selected alternatives.

The assessment of short and long-term potential environmental effects should be made **on the basis of information collated from existing sources and on information collected in the field to supplement what is available**. The extent, nature and effect(s) of knowledge gaps should be identified.

Potential environmental impacts in the area to be affected by the proposal should be discussed in terms of existing environmental values, and should be identified in the design, construction, operation, maintenance and abandonment phases of the project. The environmental values should be considered as international, national, regional, local or site-specific.

Information that may be required to carry out a satisfactory assessment shall include, but shall not necessarily be restricted to, topics outlined in this section. Options and measures available to avoid, minimize or mitigate harmful effects and to enhance beneficial effects are to be investigated and discussed under each topic. Plans for surveillance and monitoring of environmental effects should also be detailed. Impacts identified as major

(more important) are to be discussed in detail in Section 6.

The Initiator should consider and discuss all potential environmental impacts in the area to be affected by the proposed development in terms of the headings identified in Section 4 and other factors considered pertinent to the particular task.

A **Summary** of this section should be made. This should include all concerns raised as well as the options and measures available to alleviate those concerns. Major concerns requiring detailed discussion in Section 6 should be summarized in this section.

6.0 MAJOR IMPACTS AND MITIGATING MEASURES

The Initiator should identify and discuss the major environmental impacts that may result from the development.

By way of example, some of the issues that may be identified after completing Section 5 are, among others:

a) Changes in vegetative cover, including effects of fish and/or wildlife habitat;

b) Potential problems or terrain changes resulting from thawing of perennially frozen ground;

c) Alterations of water regimes, including the effects on habitats of fish and wildlife;

d) Interference with fish and wildlife populations and the effect this interference may have on the use of these populations by man;

e) Land use changes;

f) River or lake crossings that would lead to slope failures, gully erosion and related disturbances;

g) Sites judged to be of archaeological or historical significance that require protection through ordinance or by some other means.

Major environmental impacts are identified as those of long and short-term that enhance, disrupt, impair or destroy existing features, conditions or processes in the natural environment; or cause enhancement of, or conflict with, established, traditional or historic land use and ways of life; or affect the livelihood or health of segments of the human inhabitants (deleterious as well as beneficial effects); or significantly change the environmental options.

The following should be outlined as part of the discussion of each major environmental impact for each alternative presented:

- Description of the environmental impact in terms of the preceding;
- Mitigating or ameliorating measures that can eliminate or minimize deleterious impacts. These should include location changes, design changes, changes in the scheduling of associated activities, rehabilitation of impaired features, environmental education of construction and operational staff, enhancement of beneficial impacts and contingency plans for major accidents;
- Plans for surveillance and monitoring of environmental effects.

7.0 RESIDUAL IMPACTS

The environmental impacts that will remain after all practical mitigating measures have been incorporated into the alternative development proposals should be discussed in this section in terms of:

- The nature, extent and duration of all such impacts on the environmental and socio-economic spheres, and in the international, national, regional, local and site-specific context;
- The environmental significance of the potential residual impacts.

8.0 ANNEXES

The following should be included as Annexes in the Initial Environmental Evaluation:

8.1 An annotated list of references cited;

8.2 Copies of reports developed from studies associated with the evaluation.

GUIDELINES TO PREPARE AN

INITIAL ENVIRONMENTAL EVALUATION FOR

OIL AND GAS PIPELINES

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

OIL AND GAS PIPELINES

TABLE OF CONTENTS

1.0 OVERVIEW SUMMARY

The overview summary should be written in such a manner as to allow reviewers to focus immediately on items of concern. It should be written in terms understandable to the general public and in a format that allows it to be extracted directly for publication by the media (if this is necessary), or for use by senior executives requiring a rapid appraisal of the situation.

The overview summary should briefly describe the project, the probable significant environmental impacts, the ameliorating and mitigating measures to be implemented by the assessor, and the significance of the residual environmental impacts following amelioration or mitigation. Any aspects of the development which might stimulate public concern should be described with particular clarity. The summary should also clearly identify data gaps or knowledge deficiencies, and the limitations they have imposed on the Initial Environmental Evaluation.

2.0 THE PROJECT SETTING

2.1 Declaration

The Initiator and/or proponent should be identified and should take responsibility for statements and judgements in the IEE.

2.2 The Need

The Initiator should provide evidence of the demand for the proposed pipeline. The timing and routing of the project should be outlined with respect to this present or expected demand.

This section should include the primary purpose of the proposed facilities and how the proposed action fits into federal, provincial, regional, and municipal plans and requirements. Forecast curves, a description of existing and historic demands, and the location of the demand should also be outlined.

2.3 Alternatives

The Initiator should provide a description of the alternatives considered including those rejected, in sufficient detail to allow the reviewer to comparatively evaluate the costs, benefits and environmental risks of the alternatives.

Alternative pipeline routes, the upgrading of existing pipeline facilities, other methods of transportation, and the no-action alternative should also be considered.

2.4 Associated Projects

The relationship of the proposed pipeline to other existing or proposed projects (including those not controlled by the Initiator) should be discussed. This section should also identify the possible environmental concerns that might arise through the stimulated development of associated projects. The possibility of shared use of a utility corridor should be discussed.

3.0 THE PROPOSAL(S)

The alternatives not discarded in 2.3 above should be discussed under each of the headings below. The factors common to all alternatives may be discussed first, followed by a description of the factors peculiar to individual alternatives. The technical and cost restraints on the design of the project should be included.

3.1 General Layout

The corridor and/or route location should be illustrated on topographic or photomosaic maps of a suitable scale. Sizes and locations of rights-of-way, roadways and access routes, landing strips and helicopter pads, stockpile areas, compressor or pump stations, communication sites, and other ancillary facilities should also be shown.

3.2 Pre-construction Details

The Initiator should describe:

a) Nature and extent of right-of-way surveys;

b) Extent of clearing and method(s) of disposal of cuttings;

c) Location and detail of temporary stream crossings.

3.3 Construction Details

The Initiator should describe:

a) All plant and operation units to be constructed such as compressors, pumps, unloading and storage facilities, liquefaction/gasification facilities, communication installations;

b) The length, pipe size, and the method of construction to be used for all transmission, lateral, looping, and gathering pipelines in the system;

c) Design of stream, river, lake and sea crossings, their approaches, and location of shut-off valves;

d) The clearing, boundaries and schedules for each construction segment;

e) Schedules of construction, development of transportation and other public use facilities; indicate the numbers, sources, and housing needs of the work force;

f) Requirements for construction materials such as concrete aggregate, granular fill, rip-rap;

g) Location and standards of access and temporary roads.

3.4 Operation and Maintenance

The following items should be detailed:

a) The commissioning procedures of the project;

b) Technical and operational procedures including flow diagrams, timing schedules and inspections;

c) Maintenance under normal conditions - types of expected maintenance, anticipated maintenance problems, and plans for any partial or complete shutdown associated with maintenance problems;

d) Changes in traffic volumes and frequency due to operation.

3.5 Abandonment

The Initiator should outline the abandonment procedures:

a) Plans for removal or other disposition of temporary structures and facilities;

b) Plans for temporary roads, bridges and culverts; considerations may include the closing of roads to use and the removal of culverts or bridges except where removal would result in more disturbance than leaving them in place;

c) Relocation or termination plans for all pipeline and related facilities;

d) Plans for the rehabilitation of disturbed areas.

4.0 DESCRIPTION OF EXISTING ENVIRONMENT AND RESOURCE USE

This section should describe the environment as it exists prior to project development with emphasis being placed on the environmental components that are of particular importance to the area. The corridor and ancillary areas should be considered. Where knowledge gaps exist they should be noted. A qualitative and quantitative description of present resource use should also be included. Maps of appropriate scale should be included in each subsection to illustrate resource and environmental information. Sources of information should be referenced along with a description of the methods of determination.

4.1 Climate

The location of the recording station(s) should be noted along with the historic climatic conditions that prevail in the vicinity of the proposed pipeline.

a) Extremes and means of monthly temperatures, precipitation, and wind speed and direction, average depths of snow cover throughout a year;

b) The frequency of temperature inversions, fog, smoke, haze, freezing precipitation and thunderstorms.

4.2 Terrain

Describe:

a) Topographic, physiographic and geologic features and geomorphic processes at work within the area of the proposed action;

b) Physical and chemical characteristics of the soil and rocks present; soil depth;

c) Stability of slopes, permafrost distribution and temperatures, active layer development, fire hazards, and erosion problems;

d) Recognized geological and hydrological hazards such as land slides, mud flows, floods and the seismic hazards along the route;

e) Unique geological/landform features.

4.3 Hydrology

Describe important parameters of ground and surface waters:

a) Physical, chemical and biological parameters (e.g., temperature, flow rate, water table height, physical and chemical stratification, river and lake levels, fish food, productivity) likely to be affected by pipeline development; the normal seasonal variations and expected maxima and minima of these parameters;

b) Quality, supply, present and proposed use of surface and ground waters;

c) Location of sewage outfalls with respect to location of water supply intakes;

d) Nature of tides, currents, bottom contours, wave action, and shoreline characteristics in areas of proposed offshore pipelines;

e) Describe duration and extent of ice cover; extent of frozen ground below rivers.

4.4 Vegetation

Describe the plant life in the corridor area:

a) Map biogeoclimatic zones and forest cover; describe forest stand structure, maturity;

b) Describe plant communities within the proposed corridor by species and common names; indicate relative abundance of species, importance to man, and importance to native fauna as habitat and food;

c) Identify undisturbed, rare or unique vegetation; plant life of special economic, historic, social or scenic value.

4.5 Fish and Wildlife

Describe:

a) Abundance and distribution, within the area of development, of those species of fish, amphibians, reptiles, birds and mammals considered to be of significance with respect to sport, commercial, scientific, ecological or aesthetic value (listed by common and scientific names); distribution of invertebrate species considered to be important as food for the above-mentioned species;

b) Rare or endangered species which may be affected by the corridor;

c) Fish migration times and locations of spawning beds at watercourse crossings;

d) Timing and location of waterfowl nesting;

e) Areas critical to the life cycles of wildlife and migration pathways of big game animals, fur bearers, or other economically valuable species;

f) Commercial and recreational fishing activities and catches, and the ability of fish populations to withstand increased pressure as a result of improved access to the area.

4.6 People

Describe:

a) Characteristics of the population including numbers, distribution, communities, employment, public facilities and housing;

b) Cultural, social, recreational, and economic setting of the general area;

c) Attitude of local population towards the development;

d) Ability of local communities to accommodate workers during construction and the need to provide new townsites, trailer parks or other housing arrangements.

4.7 Land and Resource Use

Describe the nature, extent and location of present and projected utilization of land and resources. Reference to land classifications made under the [applicable] Land Inventory should be made where possible.

a) Agriculture: crops, dairying, grazing, livestock, poultry, orchards, mixed farming;

b) Forestry: raw material use, types of production;

c) Mining: past sites, present claims, areas presently being exploited or under feasibility study;

d) Wilderness and recreational: provincial or national parks, areas administered by Conservation authorities, game preserves, ecological reserves, other recreational areas (e.g., camping, picnicking, sport fishing/hunting);

e) Traditional: hunting, fishing, trapping;

f) Urban: residential, commercial, industrial;

g) Archaeological, historic and scenic land use sites;

h) Ownerships: public, private, or special status

5.0 ENVIRONMENTAL IMPACTS AND MITIGATING MEASURES

The discussion should describe and compare the expected environmental impacts of the alternatives with emphasis on those actions which are likely to cause major environmental disruptions. The assessment of short and long term potential impacts should be made on the basis of information collected from existing sources supplemented by field data. Where factual data area unavailable or of questionable quality, the report should clearly state that the predicted effect(s) was based on subjective judgement and that knowledge gaps exist. Impacts should be considered for the pre-construction, construction, operation and abandonment phases of the project.

The impacts should be categorized as direct or indirect - those that arise directly from the proposed project, such as interruption of fish migration due to a pipeline stream crossing, and those that arise because of secondary activities induced by the project, such as increased fishing pressure following improved access to an area.

The Initiator should consider and discuss all potential environmental impacts in the area to be affected by the proposed pipeline in terms which shall include where appropriate, but not necessarily be restricted to, the topics identified in Appendix A. Options and measures available to avoid, minimize, or mitigate harmful effects or to enhance beneficial effects should be investigated and discussed under each topic. General mitigation considerations might involve changes in route, design, scheduling, or operations.

Summarize:

- Concerns raised and options and measures available to alleviate those concerns;
- Major concerns for detailed discussion in the following section.

6.0 MAJOR IMPACTS AND MITIGATING MEASURES

The guidelines should request the Initiator to identify and discuss the major environmental impacts which may result from the development. The guidelines should identify the probable environmental issues.

Major impacts are identified as those of long and short term that enhance, disrupt, impair or destroy existing features, conditions or processes in the natural environment; or cause enhancement of, or conflict with, established, traditional or historic land use and ways of life; or affect the livelihood or health of segments of the human inhabitants (deleterious as well as beneficial impacts); or significantly change the environmental options.

The following should be outlined as part of the discussion of each major environmental impact for each alternative:

- Description of the environmental impact in terms of the above;
- Mitigating or ameliorating measures that can eliminate or minimize deleterious impacts. These might include location changes, design changes, changes in the scheduling of associated activities, or rehabilitation of impaired features. Other measures that can be considered are environmental education of construction and operational staff, enhancement of beneficial impacts and contingency plans for major accidents.
- Plans for surveillance and monitoring of environmental effects.

7.0 RESIDUAL IMPACTS

The environmental impacts that will remain despite all proposed mitigating procedures should be detailed in terms of:

a) Nature, extent, and duration of environmental and socio-economic impacts;

b) The environmental significance of the potential residual impacts;

c) Identify critical information gaps and propose terms of reference for studies to obtain the information necessary to complete the assessment.

8.0 ANNEXES

The Annexes should include:

8.1 An annotated list of references cited;

8.2 Copies of reports developed from studies associated with the evaluation;

8.3 Summaries of field data used to develop the description of the existing environment.

LIST OF REFERENCES

Department of Indian Affairs and Northern Development, 1972.
Expanded Guidelines for Northern Pipelines.

Environmental Assessment and Review Process Office, 1975.
Terms of Reference for the Preparation of Environmental Guidelines. Environment Canada

Federal Activities Environmental Branch, 1975.
Environmental Guidelines for Gas Pipeline Development. Environment Canada.

Federal Power Commission, 1973.
Guidelines for the Preparation of Applications under Section 7C of the Natural Gas Act Pursuant to Order No. 415-C. Washington, D.C.

APPENDIX A
POTENTIAL AREAS OF ENVIRONMENTAL IMPACT

The following are examples of areas where environmental impact may be anticipated:

1. Terrain and Vegetation

a) Methods of handling potential problems arising from earthquakes, landslides, avalanches, and other mass movements; design of pipeline and ancillary buildings with reference to the mitigation of such hazards;

b) Methods of minimizing disturbance of vegetation and the organic mat in permafrost or high ice-content areas;

c) Methods of minimizing instability due to differential thaw or freezing, loss of ground strength and thermokarst in permafrost areas; where uneven settlement or heave is inevitable, safeguards against pipe rupture or deformation should be proposed;

d) Terrain stabilization and erosion control procedures to be outlined including: revegetation, diversion structures, and riprap protection;

e) Plans for mining and borrow pit operations, including dimensions and volumes of excavations; location in relation to possible interactions with water bodies;

f) Borrow pit restoration -stabilization, revegetation, and disposition of surplus materials;

g) Proposed cuttings through forest; provisions for forest preservation, the utilization of lumber;

h) Locations and methods of blasting; controls on proposed use of explosives (in particular in or near waterbodies);

i) Plans for minimizing drainage disruption; extent of drainage disruption, where it is expected;

j) Methods of preserving the natural setting with the design and location of permanent facilities and the creation of buffer strips of natural vegetation between pipeline facilities, and public roads and facilities;

k) Plans to schedule clearing and actual pipeline construction so that long intervals of years do not occur between the two operations.

2. Stream, River, Lake and Sea Crossings

a) Water crossing designs and scheduling as related to interruption of spawning, rearing and safe upstream and downstream passage of fish;

b) For crossings beneath the watercourse - depth of maximum anticipated scour and of proposed placement of pipe, anticipated flow blockages either by pipe acting as a direct barrier or by ice buildup above a chilled pipeline;

c) Pipeline routes through areas of water with potential for shorefast or drifting ice; relation of depth and location to ice flows, pressure ridges, and iceberg scouring;

d) Depth of burial and associated construction activities in relation to the elimination of habitat for bottom-dwelling organisms and to sub-sea, lake or river permafrost;

e) Impact of project associated runoff, bank erosion, migration of stream channels, river regime modification, ice jams and icings;

f) Plans for fish passage structures where structure change or velocity barriers impede fish movement;

g) Design of approaches to river crossings so as to maintain stability of valley walls and river banks and to minimize changes that could lead to slope failures, gullying, entry of suspended solids, changes in water levels, degradation or growth of ground ice;

h) The design of culverts under access roads, and of overhead pipe spans for small stream and gully crossings; for culverts include predicted velocity profiles (lateral and longitudinal);

i) Methods to be used in the construction and removal of temporary stream crossings (e.g., materials to be used for reinforcement of ice bridges);

j) Pipeline routes under water bodies with potential for vessel, traffic and anchorage; relation of maximum depth of anchor drag to the depth of pipeline burial;

k) Specific measures designed to ensure the safety of offshore pipelines.

3. Water Resources

a) The hydrological and biological impact of water utilization in terms of planned sources, volumes required, and timing of extraction;

b) Methods of minimizing the addition of sediment and introduction of oils and greases into waterbodies, particularly in respect to access roads or bridges;

c) Dates and proposed methods of construction within 300 feet of any water body frequented by fish and for activities involving a continuous downslope to a water body; creation of buffer strips of natural vegetation between pipeline facilities and water bodies;

d) Interruption to river flows and alteration of lake levels in terms of timing and impact.

4. Fish and Wildlife

a) Schedules of construction activities and evidence that the project contains the flexibility to allow pipeline, road, or other construction to cease for periods of time when important areas critical to fish, wildlife or waterfowl are temporarily threatened;

b) Methods of minimizing the restriction of movement of migratory animals (in particular large animals such as moose, deer, caribou);

c) Plans for routing around or otherwise protecting areas used as: feeding or nesting areas by migratory waterfowl; as habitat by fur-bearers or big game animals; areas critical to the life cycles of wildlife;

d) Methods of minimizing disturbance of wildlife populations resulting from greatly increased human intrusions - the operations of boats, ground vehicles, aircraft, and compressor or pumping stations;

e) Safeguards proposed for the habitats of rare or endangered species;

f) Plans for assessing and controlling potential overfishing and hunting;

g) Plans to restore fish and wildlife habitats that are damaged by pipeline activities.

5. Waste, Toxins and Noise

a) Methods of solid waste collection and disposal to avoid health hazards, dispersal by wind, or attraction of wild animals;

b) Waste incineration procedures designed to minimize air pollution, ice fog, and fire hazards;

c) Treatment and disposal of sewage with provisions to prevent seepage or leakage which may contaminate the environment;

d) The nature, transportation, use and disposal of any pesticides, herbicides, pipe coating materials, anti-corrosion materials, flushing agents, or other toxic substances, proposed for the project and information on their expected persistence, toxicity and mobility in surrounding ecological system; toxin storage facilities, distance from nearest watercourse;

e) Plans for compressor station silencing equipment and/or physical barriers to noise; the level and frequency distribution of noise generated by construction and operations equipment;

f) Proposed volume, composition and disposal of pipeline test fluids;

g) Methods of disposal, incineration or other control of gaseous and liquid wastes from gas plants, compressor or pumping stations; anticipated quantities of emissions to the atmosphere;

h) Measures to ensure that there will be no discharge of petroleum products or other pollutants into or onto any lands or waters;

i) Methods of disposal or utilization of cleared trees and vegetation; procedures for slash disposal particularly in permafrost, sensitive or populated areas, near water bodies, etc.

j) Methods of minimizing sediment, slash or other waste introduction to water bodies.

6. Land and Resource Use

a) Impact on land use where the pipeline corridor passes through agricultural, forested, mined, wilderness, residential, commercial, industrial, recreational, private, or special status lands; details of any relocations which may be required;

b) Temporary restrictions on land use during construction; effect of construction on local traffic patterns;

c) Impact on property values, historic or potential land uses and regional land use plans;

d) Impact of pipeline and its construction on those who derive their income from trapping, hunting and/or fishing;

e) Surveys to identify archaeological, historic, and scenic sites prior to and during the construction phase; procedures designed to ensure the preservation of such sites;

7. Environmental Emergencies

a) The statistical probability of accidental loss of the product from the pipeline, and the probable quantity of such loss;

b) The probable effects on people and on any environmental components, of accidental spills and combustion of products, inadvertently released from the pipeline;

c) The adequacy, accuracy and effectiveness of routine methods and of systems for leak detection, and the maximum rate of loss of the product from the pipeline that could go undetected;

d) Contingency plans and response procedures for the protection and the safe removal and disposal of products accidentally or inadvertently released into the environment, including:

   i) Provisions for the prevention and control of accidental spills of petroleum products and other toxic materials;
   ii) Spill containment and disposal procedures, equipment, and equipment stockpile locations;
   iii) Techniques and schedules for oil spill clean-up under all seasonal conditions on land, into water bodies and at major depots and storage areas;
   iv) Methods and procedures for restoration of the affected components of the environment;

e) Methods of fire prevention and suppression in the corridor with the maintenance of the necessary equipment caches and the availability of properly trained personnel for fire fighting in all areas where the pipeline crew's activities may cause fires.

GUIDELINES FOR THE PREPARATION OF AN

ENVIRONMENTAL IMPACT STATEMENT FOR

POTENTIAL OFFSHORE OIL PRODUCTION

ENVIRONMENTAL IMPACT ASSESSMENT GUIDELINES

POTENTIAL OFFSHORE PRODUCTION

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1.0 INTRODUCTION

The Environmental Assessment and Review Policy of the Government of Canada requires that proposed projects initiated or funded by the federal government or with federal lands involved, and which are likely to have significant adverse environmental effects, be submitted to an Environmental Assessment Panel for review prior to the issuance of the necessary authorities to proceed. The Panel, reporting to the Minister of the Environment, reviews an Environmental Impact Statement (EIS) prepared by or for the Proponent of the project, through the Initiator department.

These guidelines have been prepared in order that the environmental impact of the proposed oil production in the Northeast Grand Banks can be determined. The Initiator for this project is the Department of Energy, Mines and Resources and the proponent is Mobil Oil Canada Ltd.

The Initiator and Proponent are expected to observe the intent rather the letter of the guidelines and to make every effort to identify and describe all environmental impacts likely to arise from the Project, even for those situations not explicitly identified in these guidelines. Any changes or major deviations from these guidelines are to be approved by the Environmental Assessment Panel prior to implementation.

It should be recognized that the EIS and its review by the public and technical agencies provide the Panel with a pool of information as a basis for its report.

It is possible that these guidelines include matters which, in the judgement of the proponent, are not relevant or significant to the project or to the study area. This should be so indicated by the proponent in the EIS. The public and technical agencies will have the opportunity to comment upon this judgement. Where the Panel disagrees with the proponent's statements in this regard, it may require additional information from the proponent before proceeding with its Report.

2.0 SCOPE

These guidelines are intended to apply to the entire Project, including the development/production systems and associated works. All major alternatives that have received active consideration are considered to be parts of the Project. Construction and operational support activities and facilities (such as temporary work camps, storage areas and transport and communication systems) are also considered to be parts of the Project.

3.0 DEFINITION OF TERMS

The following terms used in this document bear definition:

Associated Projects:

- construction, transportation and similar projects that will be required or will follow as a direct result of the initiation of the Project.

Environmental Assessment Panel (Panel):

- a group of experts appointed to review the environmental effects of the project.

Environmental Impact Statement (EIS):

- a documented assessment of the environmental consequences of an intended project or group of projects, which may have significant environmental consequences. The EIS is completed early in the planning stages of development in accordance with guidelines established by the Panel for that undertaking.

Initiator:

- a federal department or agency which tends to undertake or sponsor a project, or group of projects, having possible environmental effects and which is thereby required to take appropriate action according to the Environmental Assessment and Review Process.

Project:

- all activities associated with the development/production of oil and gas on the northeast Grand Banks which could be affected by this project, including Hibernia and Ben Nevis and associated delineation well areas and other prospects within the Jeanne d'Arc sub-basin. It also includes all works, facilities, services and activities required to construct and

operate the system and all major alternatives that have received active consideration.

Project Area:

- the exact boundaries of the proposed development on the northeast Grand Banks are to be described in the EIS together with a precise description of all associated projects both offshore and onshore. The area of the project is to be limited by the environmental impact as predicted in the EIS. For the physical environment this could extend beyond a strict geographical definition of the northeast Grand Banks, dependant upon trajectories of oil spills and the effect on biological systems, particularly natural resources used by men, (i.e., fisheries). Impacts on the socio-economic environment could also extend beyond the land mass immediately contiguous to include other areas of the Province of Newfoundland and Labrador and the east coast of Canada.

Proponent(s):

- a company, or other organization outside the federal government which intends to undertake a project, or group of projects, within the scope of the Environmental Assessment and Review Process, having possible environmental effects.

4.0 OVERVIEW SUMMARY

The Summary will consolidate the important findings of the report and will be written in such a manner as to allow reviewers to focus immediately on items of concern. It should be written in terms understandable to the general public and in a format that allows it to be extracted directly for publication by the media, or for use by senior executives requiring a quick appraisal of the situation.

The Summary should be published separately as well as being included in the EIS and should briefly describe the Project and its rationale, identify the proponent(s) and initiator, the possible major environmental impacts, the avoidance and/or mitigating measures to be implemented, and the significance of any residual environmental impacts. Aspects of the development which might stimulate public concern should be described with particular clarity. The Summary must also clearly identify data gaps or knowledge deficiencies, and the limitations these impose on the Environmental Impact Statement.

5.0 THE PROJECT SETTING

5.1 Declaration and Objective

The Proponent(s) and Initiator of the Project must be identified and the former must assume full responsibility for statements and judgements appearing in the Environmental Impact Statement.

If the project has more than one Proponent, the responsibilities of each must be clearly identified. The proponents of associated projects, upon which this Project depends, should also be identified.

The objective of the project should be clearly stated.

5.2 Project Rationale

This section should convey the primary purpose of the proposed project and how the proposed action fits into international, federal, provincial, regional and municipal plans agreements and requirements. The proponent should provide evidence of the oil or gas demand for the proposed development and the estimated discovered/undiscovered recoverable oil and gas resources. The timing of the project should be outlined with respect to this expected national/global demand and supply. Forecast curves reflecting existing and historic oil and gas demands and the location of these demands should be outlined. Methodology used in deriving estimates of supply and the qualifications and assumptions attached to them should be stated. The principal purpose of this section is to indicate the perspective against which potential impacts may be judged.

5.3 Alternatives

The proponent should provide a brief description of the major development/production/transportation strategies and technologies considered, including those rejected, in sufficient detail to allow the reviewer to comparatively evaluate the costs, benefits and environmental risks of the alternatives. Significant differences in impacts among the alternatives considered should be described.

Utilization and extension of existing facilities where they exist and cancellation, postponement, or a different pace of development of the activity should be considered as alternatives.

5.4 Interrelationship with Other Proposal and Projects

The proponent should specifically identify all associated projects that may be affected by the proposal and which in turn may cause environmental concern. Discuss the interrelationships of such associated projects and the environmental concerns identified, whether or not these concerns fall within the jurisdiction of the proponent and/or Initiator. Special attention should be paid to Newfoundland and the east coast of Canada and may include on-shore support, infrastructure, refining, trans-shipment and storage facilities.

The proponent should also generally discuss in terms of their environmental effects the long-term, probable developments or activities resulting from the proposal.

6.0 THE PROPOSAL

All alternatives not discarded in 5.3 should be discussed under each of the headings below. Factors common to all alternatives should be discussed first, followed by a description of those unique to individual alternatives. The probability of use associated with each alternative should be provided so as to give an indication of the proponent's intentions.

The Project plans must conform to existing regulations, guidelines and laws, which may be identified by referring to the appropriate agencies. The proponent should also demonstrate that consultations have been held with appropriate planning authorities.

6.1 General Layout

The Proponent(s) should provide a map showing the location of major Project facilities in relation to easily recognizable geographic features and human settlements within the Project area.

In addition, the Proponent(s) should provide suitable maps and diagrams showing the detailed locations and typical examples of:

a) Structures, platforms and vessels for drilling, production, storage, shipping, etc.

b) Pipelines and other lines required for injection, collection, transportation, service, etc.

c) Associated equipment, including well-heads, manifolds, risers, controls, transfer and mooring structures, etc.

d) Ancillary facilities, including residences, communications, fuel, water, drilling supplies, waste disposal, personnel and supply transportation systems.

6.2 Construction Details

The following items should be described in concise terms:

a) The method(s) and timing of construction for each part of phase of the proposal both on and off site.
b) The location and quantities required, and method of acquisition of construction materials or services.
c) Manpower requirements (numbers and types).
d) Routes and details of transportation facilities and equipment.
e) Location, size, duration and services of construction facilities.
f) Interruption to natural physical processes in terms of timing and other pertinent variables.
g) Any debris, effluents and emissions, including noise, in terms of quantity and characteristics caused or attributable to construction.
h) The location, method of construction, dredging requirements and scheduling for any ports and marine terminals.

6.3 Operation and Maintenance

The following items should be described in concise terms where applicable:

a) Operational methods and limitations of the proposed production/transfer systems including anticipated down-times due to weather/ice, etc.
b) The important timing and other commissioning details of the proposal.
c) Specifics of routing, destination and scheduling of transportation systems.
d) Manpower requirements.

e) Other information concerning the drilling/production/transportation systems, such as certification and inspection requirements, performance history, capacity, B.O.P. equipment and procedures, design against environmental threats (e.g. moving ice, bottom scouring by icebergs, primary and secondary earthquake effects, etc.), site position systems and/or equipment, navigation and/or communication equipment, and qualifications of personnel.

f) Proposed methods of handling or disposing of the gas obtained during oil production (re-injection, flaring, transportation).

g) Information on support craft (air and water) with respect to environmental threats (e.g. storms, wind, wave, currents and fog, ice and icing conditions, etc.) navigation and communication equipment and qualification of crews.

h) Any marine seismic activities associated with the drilling and production program(s).

i) Any interruption to natural physical processes caused by the operation in terms of timing, space and magnitude.

j) Expected releases, or stockpiles of waste or toxic substances used or generated during all phases of the proposal. Identify all potential air, land or water contaminants and outline methods of waste disposal to avoid health hazards to humans and degradation of the environment.

k) The nature and quantity of non-biodegradable debris related or lost as a consequence of drilling, production and transportation activities.

l) The quantity and quality of liquid and solid by-products of drilling, production and transportation activities, including oil and oily debris, their storage, disposal and ultimate fate.

m) Information should be provided on water requirements from fresh or marine sources including volumes, seasonal times of extraction, treatment and disposal for domestic, camp or operational purposes.

n) Sewage treatment and disposal facilities.

o) The composition, volume and method of handling and disposal of solid wastes should be provided.

p) The nature (quality and quantity), transportation, storage, use, treatment and final disposition of any biocide, pipe coating materials, anti-corrosion materials, flushing agents, drilling fluids, special lubricants and other toxic substances proposed for use

in the project and information on their expected persistence, mobility and ultimate fate in the surrounding environment.

q) Quantities and qualities of atmospheric emissions such as sulphur compounds, hydrocarbons, nitrogen oxides, water vapour, heavy metals, thermal emissions and any other potential pollutants produced during all phases of the project.

r) The quantity and quality of other atmospheric emissions such as dust, noise, and odour produced by H_2S and other by-products of the proposal.

s) Where applicable, changes in the use and frequency of existing transportation modes.

t) Documentation in support of all technical and operational aspects, including the results of field tests under comparable operating conditions of the proposed equipment of recent origin.

6.4 Environmental Hazard Prediction Systems

Describe surveillance and prediction systems needed to provide adequate protection from weather, icebergs and sea ice, sea-state and other environmental hazards, and the manner in which these will be integrated with or will incorporate observing and predicting systems of the Federal Government.

6.5 Abandonment

Plans for abandonment should include:

a) What equipment and facilities, both on shore and offshore will be removed when the project is abandoned temporarily or permanently, how and when these will be removed and how and when the area will be reclaimed, stabilized or otherwise secured.

b) Details for the release, loss, storage or ultimate disposal of any gaseous, liquid or solid contaminant stored or otherwise contained in the area.

7.0 DESCRIPTION OF EXISTING ENVIRONMENT

A general description of the environment based on available data should be presented in Section 7.0. This information will assist the reader in understanding the general pre-development setting. It is expected that, based on a general understanding of the environment as outlined in Section 7.0 and a description of the project as outlined in

Sections 5.0 and 6.0, the proponent(s) will be able to list the areas of possible impact. The proponent(s) will collect further data as required in order to assess the magnitude of the impact. The environmental impact will be defined in detail in Section 8 together with the mitigation measures proposed and the anticipated residual impact in Section 9. All pertinent data shall be included in Appendices. If this is not feasible because of quantity, the data shall be made available separate from the EIS. Care should be taken, however, not to limit Section 7 to a compilation of data but rather to describe the conditions in the vicinity of the development site in terms of inter-related ecological mechanisms and processes for the purposes of prediction in Chapter 8.

In particular, Section 7.0 should describe the natural and socio-economic environment in the area affected by the project as it exists prior to Project Development, with emphasis being placed on those components that are of particular significance. Where knowledge gaps exist, these should be noted with reference to efforts to fill these gaps where appropriate. A qualitative and quantitative description of present resource use should also be included. Maps of appropriate scale, graphs and charts, should be included in each subsection to illustrate resource and environmental information. Sources of information should be identified and acknowledged.

The intent of this section is to provide the context or baseline description of the environment in the Project Area to create a basis for identifying the possible impacts of the Project. The following outline of information requirements is intended as a guide to the nature, scope and level of detail of information necessary to adequately describe the existing environment. This outline is intended to be neither restrictive nor exhaustive and the Proponent(s) will apply judgement in selecting the baseline environmental components likely to incur significant impact from the Project activities. The eco-systems at risk should also be considered in a regional, national and international perspective with comparisons for similarity or uniqueness as appropriate.

Where it is apparent that the present environment is changing, a prediction of future conditions without the proposed project should be made.

7.1 Geology & Bathymetry

a) Physiographic and tectonic settings and geologic history of the region pertinent to review of the project including:
   (i) Surficial units in the project area,
   (ii) Bedrock geology and hydrocarbon reserve potential,
   (iii) Tectonic history and hazards with particular reference to foundation instabilities.

b) Surficial and engineering geology with particular reference to properties that are pertinent to review of the project, including:
   (i) Bathymetry, microtopography and surficial sediment distribution on the sea floor.
   (ii) Age, lithology, texture, structure and distribution of the surficial geological units underlying the sea bed,
   (iii) Features in the sea-bottom units requiring special engineering considerations, such as erosional channels, unconformities, salt domes, boulderfields, gas charged sediments, buried iceberg furrows.

c) The spatial distribution of features and the magnitude and frequency of dynamic processes that could affect the project, including:
   (i) Geopressure,
   (ii) Faults and slumping,
   (iii) Surface sediment activity (including sand waves and current scours), conditions of wave and current under which the surface sediments would be mobile. Extent to which sub-bottom sediments will be mobile if the surface sediments are disrupted.

7.2 Climate and Air Quality

Consider and discuss the following where applicable:

a) Regional climatology -climatic zone and main features.
b) Mean and extreme temperatures, frequencies and durations of temperature and windchill ranges which may have significant effects on operations. Values for various return periods should be included.

c) Wind and atmospheric stability (e.g, inversions) as they relate to the concentration and dispersion of airborne pollutants, and in combination with low temperature, to the formation of ice fog.

d) Winds in terms of frequency, direction and duration of critical speeds, mean extreme and frequency where persistently on-shore or onto ecologically sensitive areas.

e) Monthly mean and extreme precipitation and the potential for accumulation of ice and snow on structures as a result of precipitation or freezing spray, and the occurrence of air-frame icing which could significantly restrict aircraft movements.

f) Probability of specific significant ranges of low ceilings and visibilities associated with fog, cloud, precipitation or blowing snow as factors influencing operational efficiency or emergency procedures.

g) Extreme storms relative to security of drilling/production systems, support craft (air or water) and on-shore facilities.

h) Frequency of occurrence of combined events which impact on off-shore operating limits.

i) Details of the establishment of a weather sea-state and sea-ice reporting and prediction system and its integration with relevant physical oceanographic data.

j) The duration and adequacy of the climate information base.

k) Levels or air pollutants, such as sulphur compounds, NOx.

7.3 Oceanography

Consider and discuss the following where applicable, with particular attention to items that are pertinent to Section 8.2:

a) Spatial and temporal variability of surface, sub-surface and near-bottom currents, including mean and seasonal flows, tides, inertial period motions, gyres and upwelling areas, etc.

b) The presence of features, such as oceanic fronts, whose effect is to cause a convergence or divergence of the flow, thus serving to concentrate or disperse any material carried by the currents.

c) Wave climate including extreme values as they relate to structural integrity, disruption of operations, and contingency planning (including storm surges where applicable).

d) Sea ice (including icebergs, bergybits and growlers); movements, characteristics and location of their occurrence, extremes, types, probability of critical or significant occurrences, which may affect operations, impacts and mitigation measures including regular and relief wells, oil spill counter-measures, stresses on structures, etc.

e) Ice scouring with particular reference to the frequency and depth of scours and the relationship between depth and scour distribution.

f) Sea surface and subsurface temperatures and profiles.

g) Chemical oceanography including salinity, dissolved oxygen, nutrients, trace metals, hydrocarbon levels and water quality including turbidity.

7.4 Terrain

Describe the geo-morphology and biophysical nature of the shorelines and immediate hinterlands potentially affected by oil and any impacts that could occur from land-based associated activities.

7.5 Flora and Fauna

This section should describe the ecosystems within the region potentially affected by the proposed project (including trophic relationships). Account should be taken of natural variability so that any effect that may be imposed by the project can be considered in context. The following should be considered and discussed with reference to major habitats, including water columns and sea floor (nearshore, offshore, inshore, intertidal and subtidal), on and under ice where applicable.

a) Microorganisms:

- Distribution and abundance of indigenous microbiota, with special reference to oleoclasts.

b) Phytoplankton:

- Species composition, distribution, abundance and production on a seasonal basis.

c) Macrophytes:

- Species composition, distribution and abundance with special emphasis on existing (and potential) commercially important species.

d) Zooplankton:

- Species composition, distribution, abundance on a seasonal basis;
- Evaluation of biomass on a seasonal and geographic basis, including an analysis of the degree of variation.

e) Benthos:

- Species composition, distribution, and abundance on a seasonal basis in areas liable to be affected by any facet of the drilling operation, together with supporting sediment data with respect to particle size, distribution and susceptibility to oil contamination. Commercially valuable shellfish should be reviewed as a separate species.

f) Fish:

- Seasonal distribution and abundance of pelagic eggs and larvae;
- Seasonal distribution and abundance of juveniles and adults with special reference to their coastal movements along the east coast;
- Fisheries (marine, diadromous and freshwater species) with emphasis on seasonally important areas and fish densities migration behaviour, spawning requirements and sensitivities.

g) Mammals:

- Population size, seasonal distribution and movements of nearshore and offshore species;
- Designation of areas important to any species, e.g., nursery, feeding, calving.

h) Marine Birds:

- Seasonal distribution, movements and abundance of marine bird populations in nearshore and offshore areas;
- Location and population estimates of seabird colonies;

- Identification of environmental features affecting the timing of nesting and migration of the various species of marine birds in the region;
- Identification of nesting and breeding and overwintering areas for waterfowl.

i) Sensitive Species:
- The identification of any species which may be sensitive to the proposed development and that act as important food resources for other co-habiting species;
- Identification of species that may be considered rare or endangered, or important for subsistence, scientific, commercial or recreational use.

j) Historic Trends:
- Historic trends in the use of the area by animal populations, including those of direct and indirect importance, as well as those endangered by man's activities.

k) Biological Systems:
- Trophic relationships with emphasis on community shifts and multispecies dynamics;
- Predevelopment levels of potential environmental contaminants in the physical environment, and in selected indicator species;
- The capacity of biological systems to assimilate pollutants which may result from the proposed development or activity.

7.6 Socio-Economic Issues and Resource Use

Consider and discuss the following where applicable, in relation particularly to the geographic areas of Newfoundland and Labrador likely to be affected by the project:

a) The distribution and characteristics of the human population, including such aspects as population trends and composition, traditional life styles, communities, employment, public facilities and housing.

b) Economic, cultural and social setting of the region affected, including present and projected sources of revenue without the project. Information on industry,

construction, government and support services, as well as direct resource use, such as fishing and farming, should be provided, including locations.

c) Historic, existing and projected future resource use in the area of, and influenced by, the proposed development and associated projects, with particular reference to identification of fisheries, fishing locations and fish processing plants should be discussed in detail.

The economic and commercial fishery values in areas likely to suffer impact, types of gear used, seasonality and land-based industry dependent upon the fisheries should be described (including boat-building).

d) Demand and supply for land and harbour space required for support facilities; ownership (public, private or special status).

e) Description, limitations and projected changes in present support infrastructure, including roads and water.

f) Existing or potential visual, recreational, tourism, and subsistence use of land and resources.

g) Areas of special status such as ecological reserves, sanctuaries, areas of archaeological, historical or paleontological significance.

h) Projected urban and regional development with particular reference to housing.

8.0 ENVIRONMENTAL IMPACTS AND MITIGATING MEASURES

The expected environmental and socio-economic effects of the project (including alternatives identified in Section 6) should be discussed by issue in this section as well as the amelioration and mitigation measures. Mitigation should be broadly interpreted to include the issue of compensation and include information on insurance, liability and associated schemes and the costs of clean-up.

The assessment of short and long-term potential effects should be made on the basis of information collected from existing sources and on information collected in the field to supplement what is available. The extent, nature and effect(s) of knowledge gaps should be identified, particularly where such deficiencies have affected the prediction of impact. Needs for further research or data collection should be identified.

Potential impacts in the area to be affected by the proposal should be discussed in terms of existing qualities, quantities and values, and should be identified in the design, construction, operation, maintenance and abandonment phases of the project. Impacts should be considered as international, national, regional, local or site-specific, and include the analysis used to define them.

Information that may be required to carry out a satisfactory assessment shall include, but shall not necessarily be restricted to, topics outlined in this section. Options and measures available to avoid, minimize or mitigate harmful effects and to enhance beneficial effects are to be investigated and discussed under each topic. Reference should be made to those measures in place as a result of government rules, regulations and statutes. **Plans for surveillance and monitoring of environmental effects should also be detailed**. Impacts identified as major should be discussed in detail.

All potential environmental and socio-economic impacts in the area to be affected by the proposed development are to be identified in terms of the headings identified in Section 7 and other factors considered pertinent to the particular task.

This section should include the impact of the project on the existing environment in the broad context and upon the ecological interrelationships between the major species or groups of species at different trophic levels, either direct or indirect, harmful or beneficial, with emphasis on those actions likely to cause major ecological disruptions.

Thus, the biological impacts considered should include the interrelationship between primary producers, invertebrates, fish, marine and coastal birds and mammals. Interference with fish and wildlife populations and the effect this interference may have on the use of these populations by man should be described. Changes in fish and wildlife

habitat with particular reference to water quality should be included as well as shoreline habitat.

Similarly, socio-economic considerations should provide specific information and an analysis of interrelationships whenever impacts are likely to occur. Special reference should be made to the fishing industry.

The analysis used in defining potential impacts should be discussed.

A summary of this section should be made. This should include all concerns raised as well as the options and measures available to alleviate those concerns.

8.1 General

The nature, effects and constraints arising from the proposed project should be considered as applicable to the construction, production and abandonment phases with particular reference to the following items.

a) Oil pollution from all sources with particular regard to lost fishing opportunities, tainting of product, fouling of gear, and other related effects, including interruption of supply on segments of the economy dependant upon fisheries.

b) Hazards, accidents or restraints arising from geological, weather, oceanographic or other conditions and affecting the project and other activities in the area.

c) Lost fishing opportunities due to exclusion zones.

d) Sea bed disturbance and solid wastes (including debris which might foul fishing equipment).

e) Underwater noise.

f) Liquid waste, quantities and composition, including drilling mud and fluids disposal and discharge of formation and process water.

g) Supply source for materials including water.

h) Support infrastructure including its capacity to absorb demands and additional requirements created.

i) Population and employment changes and redistribution including attraction of work force into the oil industry and effects on other industries, particularly fishing due to loss of basic skills and reduced catching and processing capacity.

j) Requirements for development in support of population changes, including housing, infrastructure and government services.

8.2 Contingency Plans and Countermeasures

Following a general introduction and definition of the geographic area where the contingency plans will apply, contingency planning is to be discussed in two phases:

1. Risk Analysis and Probability:

   - In the event of a major episodic spill (well blowout, ruptured pipeline or tanker accident) estimate the type and flow rate and duration of gas and oil (or gas condensate) likely to be released. Identify the probable physical appearance of the spilled hydrocarbon (i.e., surface slick, mousse, emulsion, subsurface droplet, sheen, tarballs, interaction with ice, etc.). Include a discussion of the risks associated with the project and areas considered sensitive to oil pollution. The probability of episodic and chronic spills of various sizes and types during exploration, production or storage should be estimated and detection methods described. Estimates of, and methodology used in determining maximum, undetected losses should also be included. Similar information should be provided for other potential pollutants.

2. The risk analysis outlined above should be used to:

   a) Describe and estimate the capabilities and limitation of any countermeasures that may be undertaken to control pollutants, including oil on the sea surface (with or without the presence of ice), beneath the surface, at the sea-land interface and on land. Discuss the capability of readily stopping or controlling episodic spills at source.

b) Discuss the capability, timing and logistics of drilling a relief well (include the availability of equipment) and alternatives to a relief well.

c) Discuss the threat of ice, and severe storms and other weather conditions to the production and transportation systems and describe the countermeasures and dangers involved. A clear statement of the configurations, procedures, minimum advance warning times and time for reconnection before operations can resume should be included in this section.

d) Present a model to predict scenarios for the trajectory and dispersion for oil on the surface of the ocean using the oceanographic and meteorological inputs deemed necessary taking account of the presence of sea ice where applicable. Discuss the limitations (spatial and temporal) of the model, and the data basis used for defining and testing the model. Attention should also be given to the problem of subsurface transport and deposition.

e) Describe the organization and logistics required to track, contain and clean up a spill involving oil, gas, condensates and other pollutants for various scenarios of seasons and weather. Use scenarios for worst possible weather/oceanographic conditions. The following factors should be taken into account where applicable:

- Notification procedures and chain of command.
- Roles and responsibilities of industry and government personnel, including government responsibility centres and established reporting procedures.
- Interface with existing or proposed contingency plans (company, agency, provincial, national and international).
- Personnel and equipment requirements (provide an inventory and location for the necessary communication, containment, clean-up and disposal equipment).
- Time required for effective action.
- Methods of estimating the trajectory and dispersion of the gas in the atmosphere in the case of sour gas.

f) Discuss the behaviour of gas and oil escaping from a well blow-out or pipeline rupture at the bottom of the sea or oil/gas from a tanker.
Include in the discussion:

- Estimates of how much gas and oil might remain on the seafloor or in the water column through dissolution or change of state.
- Methods of estimating the trajectory and dispersion of the gas and oil while in the water column.
- Ultimate fate of the oil, including times for biodegradation, or other disposition.

g) Discuss the threat of a major fire associated with or on the development (including the immediate area surrounding it and ancillary facilities) and describe the fire prevention, detection and suppression during construction, operation and abandonment of the proposal.

h) Describe the training program for field personnel and proposed oil spill exercises.

i) Measures underway to increase the effectiveness of presently existing spill control and clean-up measures.

j) Provide information on the ultimate disposal for recovered pollutants including oil and oily waste.

9.0 RESIDUAL IMPACTS

The impacts that remain after all practical mitigating measures have been incorporated into the alternative development proposals should be discussed in terms of the nature, extent and duration of all such impacts on the environment and socio-economic spheres and the implications to international, national, regional, local and site-specific interests. Include in this discussion a prediction of expected effects from a clean-up operation should an oil spill occur.

10.0 APPENDICES

The appendices should include lists of references cited, lists of reports prepared in support of the assessment, lists of field data used to describe the environment and to undertake the impact analysis. All information must be made available to the Panel upon request. Additional copies of the material must be made available for public perusal at locations to be determined.

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